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XLVII.

THE TOPOGRAPHIC ANATOMY OF THE THYROID GLAND.*

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The problem was suggested by Prof. Waldeyer, of the Anatomical Institute of Berlin, and the work was begun in his laboratory in the summer semester of 1904.

It was recognized that many observations had been made upon the topography of the gland, but since they were made before the present methods of preservation of material were in use it seemed advisable to undertake this work. Accordingly most of the material used was formalin hardened, the remainder being hardened by arterial injections of alcohol 2 parts, carbolic acid 1 part, and glycerin 1 part. The material consisted of 23 fetuses, ranging in age from five months

*From the Anatomical Laboratory of St. Louis University.

to term—all formalin hardened[1]; 19 children from 1 to 7 months of age, formalin hardened[2]; 55 adults from 20 to 70 years of age, 30 formalin hardened, 25, alcohol-carbolic acid-glycerin hardened.

Two methods of making the measurements were used, (1) from sagittal and transverse sections, and (2) from dissections.

The sagittal sections show at once the position of the isthmus of the gland with reference to the vertebral column and the trachea. The transverse sections were reconstructed on profile paper, so as to show the relations of the gland to the vertebral column and surrounding organs. (The reconstructions were made according to the method described in the Topography of the Thorax and Abdomen, University of Missouri Studies, Science Series, Vol. I, No. 1.)

When the neck region was dissected in the ordinary way, the measurements were made by driving a steel pin vertically through the isthmus of the gland into the vertebral column and using it as a point from which to measure in all directions. A point on the profile paper was taken to represent the position of the pin, and all of the structures were located on the paper in accordance with the measurements on the body. The measurements were taken in a horizontal plane and not over the convex surface of the gland. When the gland and other soft parts had been removed, the vertebral column was mapped out in the same way as the gland by using the point where the pin entered the column as the starting point for the measurements. In some cases the soft parts only were measured, thus giving the relations of the gland to the trachea.

In the following description the gland will be considered as composed of an isthmus and two lateral lobes. The gland as a whole is roughly U-shaped.

Each lateral lobe is more or less cone shaped, with its apex extending considerably above and its base only a little below

1. Most of these were material belonging to Dr. Jackson, University of Missouri, upon which he worked out the topography of the pancreas. This part of the work was done in Prof. Waldeyer's laboratory.

2. The neck organs were removed at autopsy by Dr. Thompson, Dept. of Pathology, St. Louis University, and placed in formalin.

the plane of the isthmus. The external surface of the gland is markedly convex from side to side, and slightly so from above downward. The internal surface is concave from before backward, fitting accurately over the sides of the larynx, trachea, pharynx and esophagus. The isthmus is the thin plate of gland substance molded over the anterior surface of the trachea, uniting the contiguous surfaces (margins) of the lower part of the lateral lobes.

The relationship which the gland bears to the other structures in the region is well shown in Figures 1 and 3.

The anterior surface of each lateral lobe is covered by the sternothyroid muscle and separated from it by a thin layer of fascia. The inner margin of the sternohyoid muscle overlaps the inner margin of the sternohyoid a few millimeters, so that the uncovered (intermuscular) portion of the gland is reduced to a small area. This interspace becomes smaller from above downward, since the muscles of the two sides almost meet in the midline at the lower margin of the isthmus, thus leaving only a small V-shaped portion of the gland not covered with muscle. This medial portion of the isthmus is covered with superficial fascia and skin containing small veins of the inferior thyroid and anterior jugular systems. The anterior margin of the sternomastoid crosses the region of the lateral lobes obliquely from below upward and outward.

Each lateral lobe lies between the carotid sheath externally, the trachea internally, and the above named muscles anteriorly. The upper part of the lobes usually extend as far back as the sides of esophagus and pharynx. In the child and fetus the lobes protrude, in many cases, into the postpharyngeal space, and while they seldom meet behind the pharynx the two lobes hold it in a firm grasp.

While the thyroid is a true cervical organ, it comes into close relationship with such thoracic organs as the lungs and thymus gland. The lower pole of each lobe is separated from the apex of the corresponding lung in the adult by a small interspace containing the vertebral and ascending cervical vessels and the arch of the thoracic duct (on the left side).

In Figure 1 the apices of the lungs, which lie only about 2 mm. below the surface of the section, are indicated by

the dotted lines in the quadrilateral spaces bounded by the first ribs and the scaleni and longus colli muscles.

Figure 2 shows the relative levels of the lung and gland in the adult, while Figure 4 shows the relation in the fetus at term where the gland is much higher in the neck, and consequently not in close relation with the lungs.

By comparing Figures 1 and 2 with 3 and 4 it will be seen that the superior division of the mediastinum is much larger proportionately in the fetus than in the adult and is filled, in its anterior portion, by the thymus gland, which comes into close relationship with the lower part of the thyroid. In many of the dissections of the fetus these glands were in direct contact.

The parts of the gland will be located with reference to the vertebral column and then with reference to the trachea and larynx; first as determined by projections from dissections and then by projections from cross sections.

THE ADULT GLAND.

1. *As Measured from Dissection.* The isthmus lies over the seventh cervical and first thoracic vertebrae. In every case the upper border of the isthmus was below the disk between the sixth and seventh cervical vertebrae. In more than 50% of the cases the upper border of the isthmus is below the disk between the seventh cervical and first thoracic vertebrae, but in only two cases is it below the first thoracic vertebra.

It lies upon the three first rings of the trachea. In 66% of cases it completely covers the first ring, but in no case does it overlap the cricoid cartilage to any considerable extent. In every case its upper border is above the middle of the second ring. The isthmus is so variable in size and width that its lower border may be found anywhere from the third to the sixth ring. In the few cases, three in the series, in which it reaches the fifth or sixth ring it extends below the lateral lobes. More than half of all the cases cover rings two and three.

The apex of the right lobe varies from the upper part of the fifth to the lower part of the sixth cervical vertebra, with the greater number opposite the fifth vertebra and fifth disk. The apex of the left lobe is never higher but often a little

lower than the right, the difference being only a few millimeters in any case. However, a much larger number of the left than of the right were below the fifth intervertebral disk.

The lower poles do not show so much variation as do the apices, nor do they differ as much from each other. The ordinary variation in position is from the middle of the first to the lower part of the second thoracic vertebra, with the larger proportion of the cases above the second vertebra.

Each lateral lobe extends upward and backward along the sides of the larynx and pharynx into a conical space bounded internally by the larynx and pharynx, anteriorly by the sternothyroid and omohyoid muscles, and posteriorly by the carotid sheath and the prevertebral fascia. The upper part of the anterior border follows more or less closely the attachment of the sternothyroid muscle to the oblique line of the thyroid cartilage.

In 27 cases the thyroid cartilage was projected along with the gland to show the relative position of the apex of each lateral lobe to this cartilage. The united portion of the anterior portion of the alae is used as the basis of comparison. In 13 of the 27 cases the apex on the right was as high as the upper end, while only six of the left lobes reached this level. Of the other 14 right lobes, 9 reached the middle and 5 only the lower end of the anterior border. On the left side six were on a level with the upper end, 13 the middle, and 8 the lower end of this border.

2. *As Measured from Cross Sections.* The projections made from cross sections show the relation of the glands to the vertebral column only, since these projections were made for a different purpose and the larynx and trachea were not included in them.

The average position of the isthmus is over the first and second thoracic vertebrae. Its upper border may be as high as the middle of the seventh cervical, and its lower border as low as the third thoracic disk, but since it is usually about as broad as a vertebra and disk, when the upper border is high, the lower border is correspondingly high, and vice versa.

The apices of the two lateral lobes are at about the same level in most cases. They vary from the fourth to the sixth cervical disk, a majority being opposite the fifth and sixth vertebrae. The lower poles of the two lobes are usually

at about the level of the first thoracic vertebra. In nearly every case the lower lobes were above the second thoracic vertebra.

THE GLAND IN THE CHILD.

From the material at hand it was only possible to locate the gland with reference to the larynx and trachea, because all the material at this stage had been removed at autopsy. The upper border of the isthmus touches the cricoid cartilage in a majority of cases. The cricoid is completely covered in 7 of the 19 cases. In every case except one the first ring of the trachea is covered. In this one case the isthmus is very narrow and might be said to be absent, for it is difficult to distinguish any thyroid tissue in it macroscopically. The isthmus covers rings 2 and 3; one-half ending below ring 3, and the other half passing over ring 4.

The lateral lobes appear to be proportionately larger and less conical than those of the adult. In nearly every case the apex is at the level of the base of the superior cornu of the thyroid cartilage. They cover most of the cricoid cartilage and that part of the thyroid cartilage below and behind the oblique line, so that the sternothyroid muscle is displaced upward and forward at its attachment to the thyroid cartilage and is made to hook over the anterior border of the gland instead of passing to its attachment in the plane of the body of the muscle, as it does in the adult.

THE GLAND OF THE FETUS.

Most of the specimens were full term fetuses hardened in the dorsal position by injection with formalin.

The gland is very much like that of the young child in size and position. The isthmus corresponds to the fifth and sixth cervical vertebrae (Figs. 2 and 4), usually not extending below the middle of the sixth. It lies over the first four rings of the trachea. In about 30% of the cases it was high enough to lie over the cricoid, but in these cases it usually did not reach below the third ring of the trachea.

The lateral lobes extend high up into the space between the thyroid cartilage, sternothyroid and omohyoid muscles and carotid sheath. In many cases they extend beyond the outer border of the omohyoid muscles into the superior carotid

triangles. These lobes are so thick anteroposteriorly that they displace the sternothyroid muscle at its attachment to the thyroid cartilage, as in the child. The apex of the lateral lobe is usually high upon the posterior part of the thyroid cartilage, being as high as in the child and almost constantly higher than in the adult.

VARIATIONS AND ANOMALIES.

The middle lobe or pyramid varies more than any other part of the gland, both in size and position. It may be entirely absent, or vary from a small tubercle on the upper margin of the isthmus, or one of the lateral lobes, to a well developed band of gland tissue extending upward to the hyoid bone. It is more often connected with the left lobe at its union with the isthmus than with any other portion of the gland, though it not infrequently connects with the right lobe. Nearly every gland has a more or less well developed band connected with its upper border, though only about three-fifths of these bands contain any gland tissue. This band can be traced to the hyoid bone, to the posterior inferior margin of which it is attached. The usual structure of this band is connective tissue, containing gland substance below and muscle fibers above—the muscle fibers may or may not fill in all of the remaining portion of the band. Occasionally two or more separate nodules of gland tissue are imbedded in the band and connected to each other by muscle fibers. When the muscle fibers are well developed and the gland substance reduced to a small nodule on the upper part of the isthmus it is called the levator glandulae thyroideae, but all of these conditions should be classed together as being persistence of the thyroglossal duct.

The isthmus is rarely absent, though many times it is only a very thin band of gland substance. In this series it was entirely absent in one fetus and one adult, and practically absent in two other cases.

Among the glands which were dissected there were several with one or more accessory slips of muscle. When there was but one slip it was considered as the levator glandulae thyroideae, even though it was not connected with the isthmus of the gland. In a few cases this middle slip was found along

with an extra slip to each lateral lobe. Figures 5 and 6 show this condition. In these cases the muscle fibers arise from the fascia covering the anterior surface of the gland and end by blending with the inner margins of the thyrohyoid muscles. In Figure 5 the fibers end near the lower part of the thyroid cartilage, while in Figure 6 they remain more or less separate up to the hyoid, where they insert along with the inner fibers of the thyrohyoid. In Figure 5 the middle slip (f) does not contain many muscle fibers, but from its position and appearance it may be taken to represent the thyroglossal duct. In Figure 6 this middle slip (i) is muscular and well developed and arises from both surfaces of a small pyramidal lobe

Figure 7 has two well developed slips symmetrically placed, but without any well defined remains of a median portion. These fibers arise from the fascia along the upper margin of each lateral lobe and may be traced to the hyoid bone as the inner portion of the thyrohyoid.

Figure 8 is from a child seven months old. It shows a condition different from those described above. Here the three slips are found, but the right one arises from the fascia on the posterior surface of the gland, while the left one arises from the anterior surface. Otherwise this case does not differ from the others.

These muscle slips do not correspond to the extra muscles of this region, as described in Porier and Charpy, in that they do not connect with the constrictors of the pharynx.

CONCLUSIONS.

1. That the thyroid gland is smaller, proportionately, in the adult than in the fetus and young child.
2. That the thyroid gland descends upon the vertebral column with the assumption of the erect position.
3. That there is an apparent descent of the thyroid gland upon the neck organs. The gland is lower on the thyroid and cricoid cartilages of the adult, but it is attached to the same rings of the trachea. This apparent descent may be due to the fact that the hyoid, thyroid and cricoid are telescoped upon each other in the fetus and young child and thus brought closer to the fixed part of the thyroid gland.
4. That some remains of the thyroglossal duct can be

found in almost every case, and that a pyramid is present in over three-fifths of all cases.

5. That the isthmus may be very small, but that it is rarely entirely absent.

6. That accessory muscle slips are to be found, which seem to be aberrant slips of the thyrohyoid or possibly of the sternothyroid. They do not appear to have any special function, but act in conjunction with the fascia to hold the gland in position.

EXPLANATION OF FIGURES.

Figure 1. Section through lower portion of first thoracic vertebra. Adult.

sp. c. spinal cord.
d. m. dura mater.
c. centrum of first thoracic vertebra.
r. first rib.
l. c. longus colli.
v. v. vertebral vessels.
n. eighth cervical nerve with its junction with first thoracic nerve.
th. d. arch of thoracic duct.
sc. a. scalenus anticus.
c. s. carotid art., jugular vein and vagus nerve in carotid sheath.
p. platysma.
a. j. v. anterior jugular vein.
st. hy. sternohyoid.
st. th. sternothyroid.
th. gl. thyroid gland.
tr. trachea.
i. th. v. thyroid vessels (inferior).
oe. esophagus.
s. g. inferior cervical sympathetic ganglion.
tr. p. transverse process of vertebra.

Figure 2. Reconstruction of thyroid gland and surrounding structures from set of sections to which Figure 1 belongs.

m. manubrium sterni.
cl. clavicle.
l. lung.
r. rib.
v.-vii. cervical vertebra.
i.-iv. thoracic vertebra.

Figure 3. *Section through sixth cervical vertebra. Fetus at term.

o. h. omohyoid. Other labeling same as Figure 1.

Figure 4. *Reconstruction of region of thyroid of fetus, of which the section shown in Figure 3 is part.

thym. thymus gland. Other labeling same as Figure 2.

Figure 5. Thyroid gland with accessory muscles.

5a. front view.
5b. right lateral view.
5c. left lateral view.
a. thyroid cartilage.
b. cricoid cartilage.
c. thyroid gland.
d. extra muscle of right lobe.
e. extra muscle of left lobe.
f. fascia, etc., representing remains of thyroglossal duct.
l. hyoid.
m. thyrohoid.
n. sternothyroid.
o. oblique line of thyroid cartilage.
p. sternohyoid.

Figure 6. Thyroid gland with accessory muscles.

6a. front view.
6b. right lateral view.
6c. left lateral view.
h. extra muscles of right lobe.
g. extra muscles of left lobe.
i. levator glandulae thyroideae.
Other labeling same as in Figure 5.

Figure 7. Thyroid gland with accessory muscles.

7a. front view.
7b. right lateral view.
7c. left lateral view.
k. extra muscle of right lobe.
j. extra musle of left lobe.
Other labeling same as in Figure 5.

Figure 8. Thyroid gland of child with accessory muscles.

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*Figures 3 and 4 are from a reconstruction by Dr. H. D. Kistler, awarded a gold medal by the International Jury of Awards, L. P. E., St. Louis, 1904.

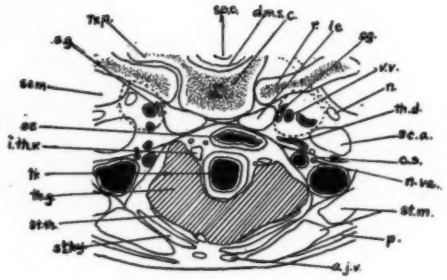

Fig.1

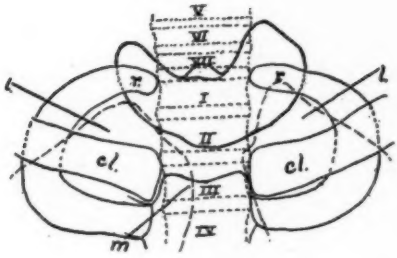

Fig. 2.

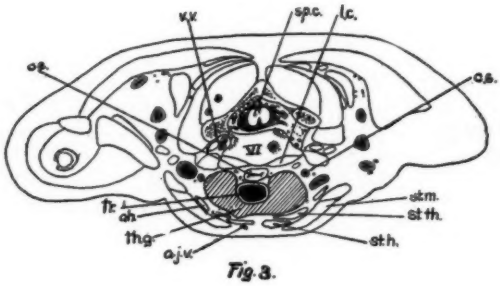

Fig. 3.

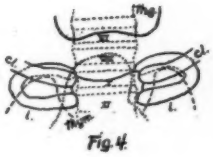

Fig. 4.

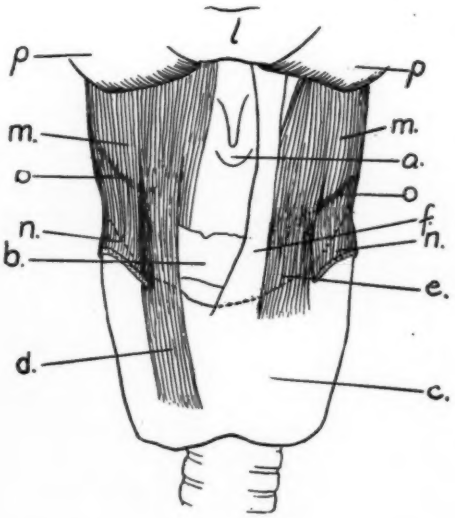

Fig. 5a

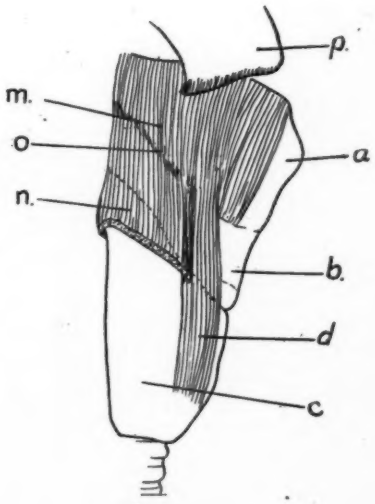

Fig. 5b

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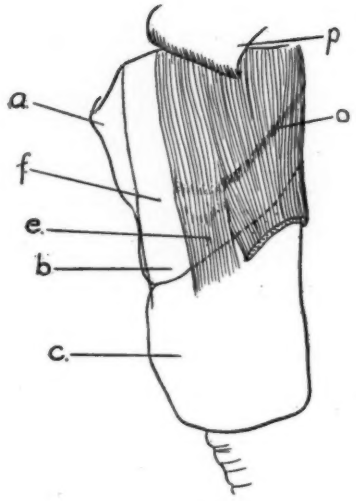

Fig. 5c

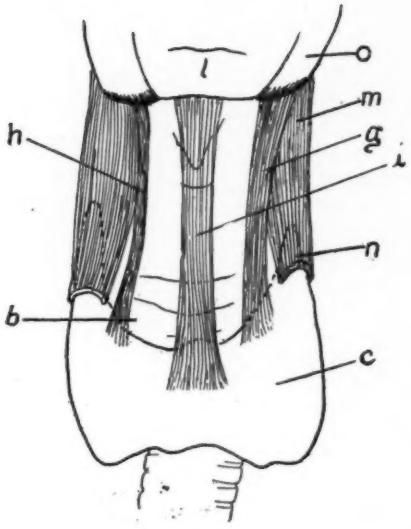

Fig. 6a

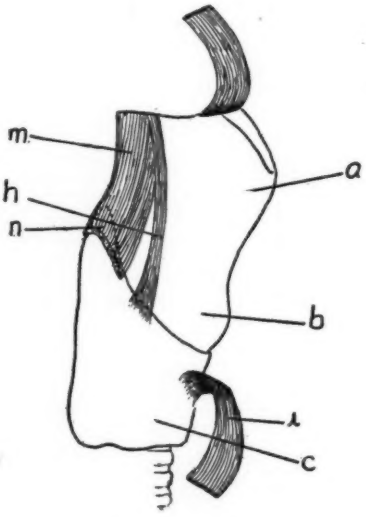

Fig. 6b

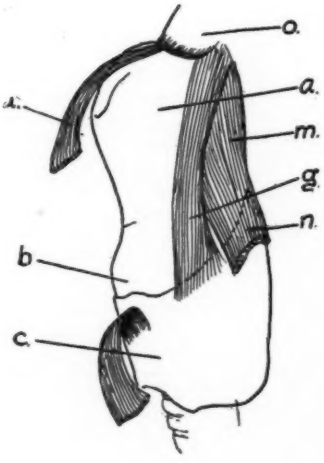

Fig. 6c

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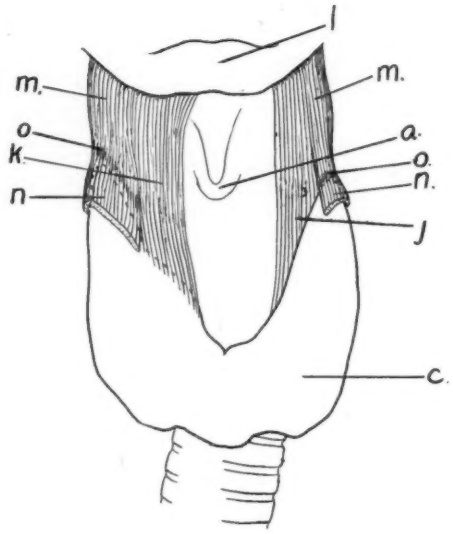

Fig. 7a

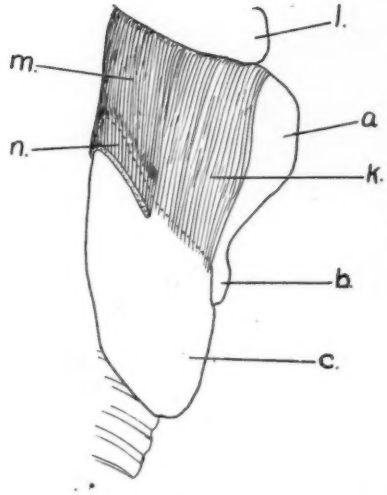

Fig. 7b

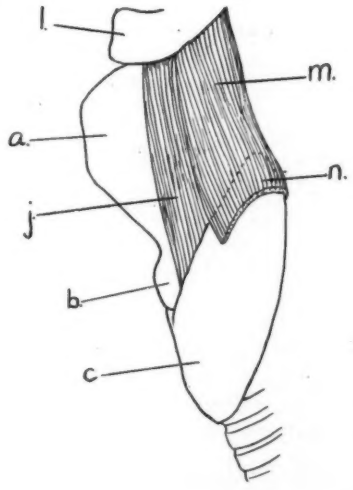

Fig. 7c

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XLVIII.

THE X-RAY EXAMINATION OF THE MASTOID REGION.*

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In many branches of medicine and surgery the Roentgen rays have become almost indispensable as an aid to diagnosis, and frequently the nature of some obscure condition is absolutely determined by the radiogram. The value of radiography has become well established in the field of rhinology, especially in the examination of the accessory cavities of the nose, so that sinusitis, or tumors of the antrum of Highmore, of the ethmoids, and the frontal sinus, can be definitely outlined. Radiography in rhinology not only lays bare pathologic conditions, but also gives valuable aid in outlining anatomic relations, so that the surgeon may proceed with greater assurance in opening these cavities when they are diseased. Thus Beck[1], after obtaining an exact outline of the frontal sinus in the skiagram, turns down the anterior wall of the sinus and subsequently replaces it by a plastic operation. Ingalls[2] does not hesitate to drill into this cavity by the nasal route, after he has determined its anatomic position in the radiogram. To Caldwell[3] belongs the credit of having established the proper angle for the delineation of both frontal sinuses upon the same plate.

In exposing the temporal bone to radiographic examination, greater obstacles are to be met with than in examining the sinuses and bones of the face, because it is difficult to obtain a profile of one temporal bone without superimposing upon it

*Thesis presented to the American Laryngological, Rhinological and Otological Society, January 1st, 1909.

the shadow of the other. In fact, the chief difficulty in radiography of the cranium is to establish the proper angle at which the picture is to be taken, in order to avoid the shadows of the thicker portion of the skull.

Thus Voss[4] and Winckler[5], by taking pictures in the transverse diameter of the skull, report excellent results in outlining the mastoid region as well as determining its condition of health or disease.

Kuhne[6] and Plagemann[7] prefer taking pictures in the occipito-frontal direction, since thereby an image of both mastoid processes is obtained at one time and upon the same plate. Judging from the illustrations accompanying their article this method is open to objection, since the temporal bone is too far removed from the plate to give a sharp image, and only a portion of the mastoid process appears in the Roentgen picture.

Considering the difficulties frequently encountered in diagnosticating diseases of the mastoid process, it has for some time past seemed advisable to me to obtain radiograms of the mastoid region; and I was fortunate in having an expert radiologist, Dr. S. Lange, kind enough to undertake this work. To him I am indebted not only for his untiring efforts, but also for valuable suggestions.

The greatest obstacle to be overcome was in establishing the proper angle from which uniform results might be expected. At my suggestion the oblique profile of the temporal region was employed. Subsequently Dr. Lange suggested taking measurements of the angle of inclination of the X-ray diaphragm, so that greater precision might be had. These points will be further elucidated in describing the technic.

We have taken radiograms of the dry skull, of the cadaver and of a considerable number of patients. In all we have collected about fifty plates.

TECHNIC.

The technic is as follows:

A small piece of lead foil is plastered to the tip of the mastoid process in order to fix this point in the Roentgen picture. For the same reason a coil of wire is introduced into the auditory meatus. The auricle is then drawn forward and fastened by adhesive plaster to the cheek of the patient in

order to hold it away from the mastoid region. The patient then lies on his side on the table, or sits upon a chair, with the ear to be examined in contact with the photographic plate. The diaphragm of the X-ray tube is then adjusted immediately below the parietal eminence on the opposite side of the patient's head, and is given a slant, so that the rays will be directed through the cranium toward the sigmoid sinus and mastoid process of the ear which is being radiographed. (See Figs. 1 and 3.) In this position, the temporal bone on the upper side of the skull is left almost entirely out of the radiographic field. Dr. Lange has measured the angle of inclination of the axis of the diaphragm and finds it to be as follows:

First, it is inclined 25 degrees to the basal plane of the skull, and secondly, it is tilted backward 20 degrees from the coronal plane of the skull. (See Fig. 1.) This step of the technic is very important because it assures uniform results.

The time of exposure varies from 20 to 50 seconds with an electrolytic interrupter, to 4 minutes with a mercury turbine interrupter. For comparison it is advisable to radiograph both temporal bones at the same sitting.

Figure 2 shows a quarter section of the dry skull, in which some of the landmarks are brought out by filling them with lead foil. This experiment enables the observer to fix the anatomic relations in subsequent pictures. This radiogram shows very well the internal structure and relations of the temporal bone and requires no further description.

The next illustration (Fig. 3) shows the mastoid region traced from a radiogram taken through the entire skull. The anatomic structures are here very distinct, and it will be observed that the one mastoid is entirely out of the field

Figures 4 and 5 are tracings from radiograms of normal mastoid regions in different patients. It is impossible to reproduce some of these plates except by tracings. These illustrations show the relative position of the middle fossa of the skull, the outline and cellular arrangement of the mastoid process, the position of the external auditory canal and frequently of the sigmoid sinus.

As may be judged from the illustrations, practically all of the skiagrams delineate very accurately the anatomic relations of the mastoid process. Considering the great variability in the structure of the temporal bone, it is apparent how

valuable this knowledge obtained prior to an operation may become. Indeed, should radiography give no further information than this, it would still repay the otologist to obtain those Roentgen pictures. As a matter of fact, however, the skiagrams reveal not only anatomic relations, but also, in some cases, pathologic processes in the interior of the mastoid process.

In certain cases of chronic suppurative otitis media the radiograms showed practically an absence of mastoid cells, the sclerosed bone throwing a dense shadow. Such pictures were obtained in five cases. (See Fig. 6 and 7.) In four instances the Roentgen pictures were confirmed by operation.

In one case, that of a man 21 years, with chronic otorrhea, osteosclerosis was diagnosticated in the right ear, with the probable absence of mastoid cells. (Fig. 7.) The left ear taken at the same time for comparison, showed a massively developed pneumatic process. Operation revealed a dense mastoid process with a very small antrum, which was only uncovered after working according to the method of Stacke.

A second operative case was that of a boy of twelve, with chronic suppuration in the left ear. The sinus, the tegmen tympani and the mastoid process were found exactly in the condition indicated by the picture. (Fig. 8.)

The third case was one of tuberculosis of the middle ear in a man of forty-five. The two radiograms, taken at intervals before the operation, showed a very large mastoid process of penumatic type with hazy outlines of its cells. Operation revealed a large mastoid process with numerous large cells, most of which were filled with a clear serous fluid. The middle ear and antrum contained granulations. (Fig. 9.)

The fourth case was operated upon too recently for description.

From the experience gained by this investigation, the following conclusions may be drawn:

First. It is quite feasible to radiograph the mastoid region.

Second. The best skiagrams are obtained by directing the rays so as to give a slightly oblique profile of the temporal region.

Third. The radiogram distinctly outlines the anatomic relations of the external anditory meatus, the limits of the mastoid

process and of the mastoid cells. The floor of the middle fossa of the skull is shown, as well as the thickness of the tegmen tympani. The sigmoid sinus is frequently delineated and its position indicated.

Fourth. Osteosclerosis of the mastoid bone, following prolonged otorrhea, may in some cases be determined by the X-ray examination.

Fifth. It is possible that pus and granulations (Voss), as well as sequestra (Winckler), in the mastoid process can be diagnosticated by means of the X-ray. It must be stated, however, that acute inflammataion of the mucosa is difficult to differentiate from softening of the bone (Plagemann).

Sixth. In general it may be stated that radiography should prove of great value in the determination of both the anatomic and pathologic conditions within the temporal bone.

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FIGURE I.

Radiography of Mastoid Region, showing relative positions of plate, X-ray diaphragm and patient's head. Note the inclination of the X-ray diaphragm. (The radiograms may be taken to advantage with the patient lying on his side, but with the diaphragm in the same relative position as in Fig. I.)

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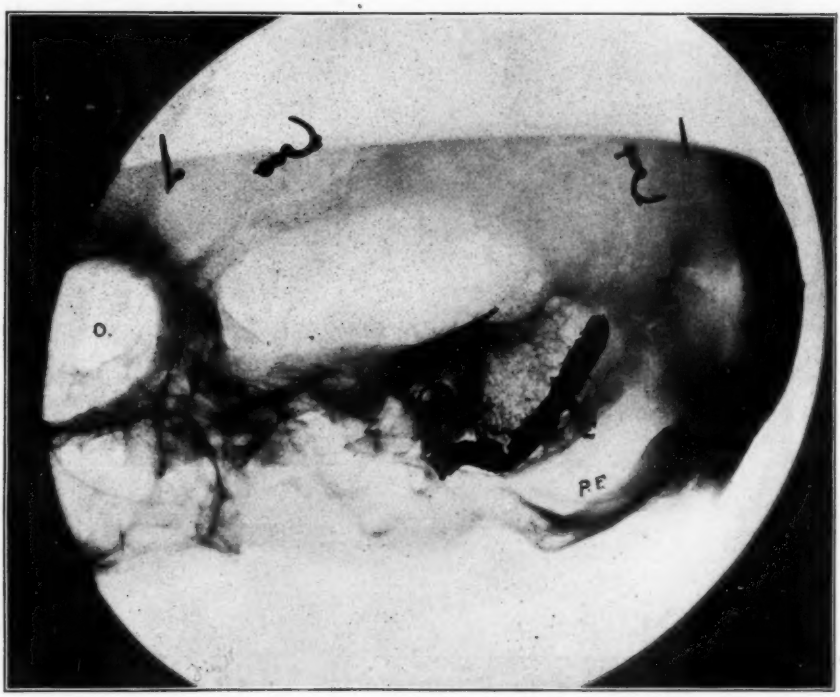

FIGURE II.

Quarter section of a skull with lead foil in the sinus, and a wire in the auditory meatus and in the middle fossa. (P F) Posterior fossa. (E) Foramen for emissary vein. (Arrow) Indicates descending portion of facial canal. (O) Orbit. (Z) Zygoma.

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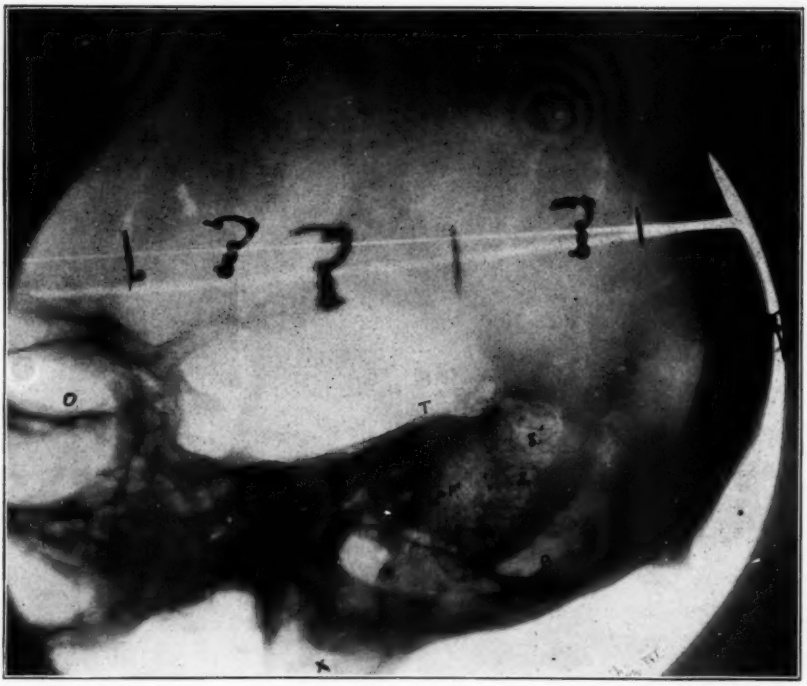

FIGURE III.

Radiogram of a dry skull, showing left mastoid region taken in an oblique profile. The lower shadow (X) is the right mastoid thrown out of the field by the oblique direction of the X-rays. (M) Meatus. (T) Tegmen. (SS) Sinus. (P) Styloid process. (Arrow) Facial canal, in the mastoid. (Z) Zygoma. (O) Orbit. (B) Floor of post-fossa.

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FIGURE IV.

Print and tracing from plate of a normal mastoid region in a young woman. (*) Meatus. (X) Mastoid cells. (SS) Sinus. (M) Mandible. (E) Middle fossa.

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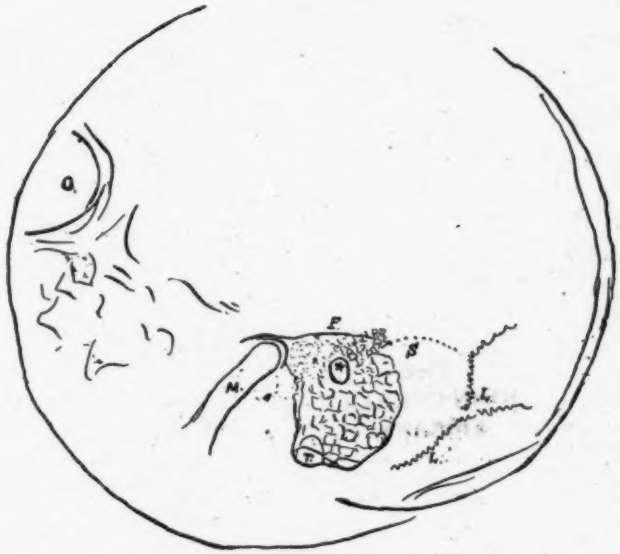

FIGURE V.

Tracing from a radiogram of a normal, left mastoid in a man of 37. (*) Meatus. (T) Large cell in the mastoid tip. (F) Middle fossa. (S) Sinus (?). (LL) Suture lines. (M) Mandible. (O) Orbit.

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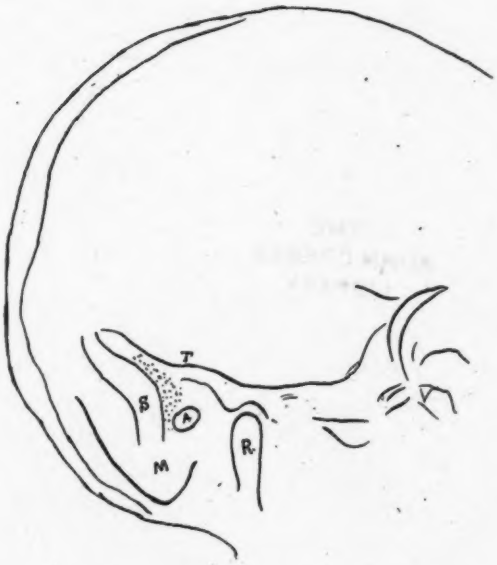

FIGURE VI

Tracing from a radiogram. Right mastoid region in a case of chronic otorrhea of many years' standing. Note absence of mastoid cells, i. e., osteosclerosis. (S) Forward-lying sinus. (M) Mastoid. (A) Meatus. (T) Tegmen. (R) Ascending ramus of mandible. (Patient of Dr. William Mithoefer.)

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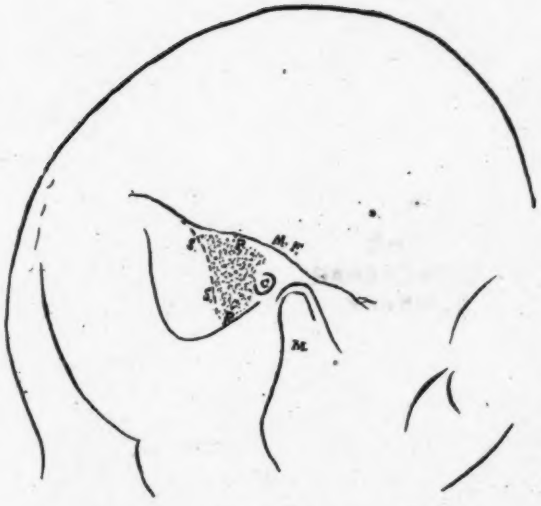

FIGURE VII.

(Case I.) L. K. Right mastoid region, showing: (PP) Osteosclerosis of mastoid. (SS) Sigmoid sinus. (M) Mandible. (MF) Middle fossa. (C) Meatus. (Confirmed by operation.)

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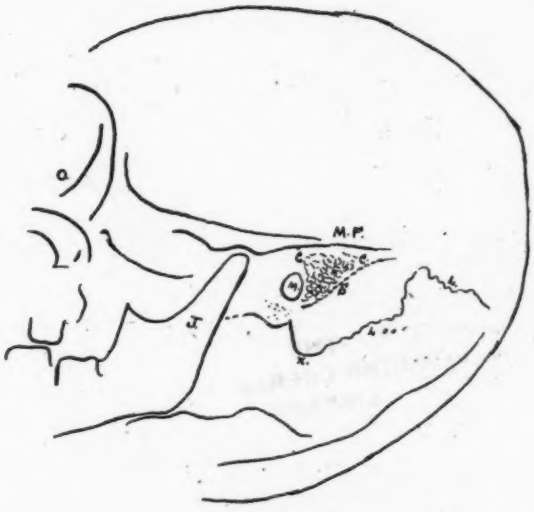

FIGURE VIII.

(Case II.) Tracing from a radiogram. Left mastoid region. (M) Meatus. (MF) Middle fossa. (CC) Mastoid cells. (S) Anterior border of sinus. (J) Mandible. (LL) Suture lines. (O) Orbit. (X) Top of mastoid.

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FIGURE IX.

(Case III.) Radiogram tracing tuberculosis of middle ear and mastoid. Large mastoid of pneumatic type. Cells appear hazy in the radiogram. (Confirmed by operation.) (•) Meatus. (S) Zygoma. (O) Orbit. (MF) Middle fossa. (J) Mandible.

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XLIX.

REMARKS ON THE PHYSIOLOGY AND DEVELOPMENT OF THE NOSE AND ACCESSORY SINUSES AND NASAL REFLEXES, WITH SPECIAL REFERENCE TO THE FUNCTION AND IMPORTANCE OF THE TURBINATED BODIES.

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Detroit.

The nose constitutes a protective mechanism important for the economy of the body. Its physiologic significance is underestimated, especially during infancy and childhood, when the nasal organ is more or less predisposed to inflammatory obstruction.

Disse, the embryologist, and others have demonstrated that the nasal passages of the child differ in relative size and form from those of the adult; for while in the infant at birth the ethmoidal portion of the nasal space is twice as high as that of the maxillary portion, in the adult they are of equal height. Somewhere near the eighth year the nasal space assumes relative adult proportions, the maxillary portion equals in height that of the ethmoidal portion, and with this growth and the descent of the hard palate, the nostrils develop slowly.

Figure 1 shows a section of a fetus eight months old, by Mihalkovics, to represent the difference in height of the ethmoidal and maxillary part of the nasal chamber. The ethmoidal is twice the height of the maxillary portion of the nares.

During the first three years respiration is confined chiefly to the upper ethmoidal portion, the lower portion being very narrow and the inferior turbinated bone touching the floor of the nose. (See Figure 1.)

In this manner we may account for the dangers of acute inflammation of the nares in the infant, which become distressing and dangerous on account of interference with proper feeding and oxygenation.

Figure 2 shows a frontal section of the facial structure of a child four years old, by Mihalkovics, showing an undeveloped lower nasal chamber; the ethmoidal part of the nasal fossae is still larger than the maxillary part.

Figure 3 is Mihalkovics' frontal section of the facial structure of an adult, showing the development of both the maxillary and ethmoidal part of the nose, they being equal in height.

Figure 4 is Chiari's section of a newly born infant, showing the predominence of the cranium over that of the face, and the ethmoidal nasal space over the maxillary. The face, while helping to form the orbit and nasal cavity, is essential for the jaws and teeth. The greatest change is the downward growth of the face. In the infant the face is to the cranium as one to eight; at two years as one to six; at five years, as one to four; at ten years, as one to three; and in the adult, as one to two.

DEVELOPMENT OF HEAD AND FACE.

The head and face grow more rapidly in two periods. The first is from birth to the eighth year. The second begins at puberty, or at the fifteenth year, when the head and face develop in all directions alike, and are completed in the female about the nineteenth year; and in the male at about the age of twenty-one. During the intervening period, from the seventh to the fifteenth year, much less growth takes place. The development of the child's face may be divided into three stages. During the first year the development of the head and face is general, but the face gains distinctively on the cranium, more especially in the lower nasal cavity. The second stage is ushered in at the second year, to continue to the fifth year, when the face grows more in breadth. From the fifth to the seventh year the face grows more in length, while the nose develops chiefly in the lower region. The hard palate, forming the floor of the nose, descends to increase the dimensions of the space above. At birth, the hard palate, if prolonged back, would strike near the junction of the basillar process and sphenoid. At the age of three it has grown downward to strike near the middle of the basillar process, and at the age of six it may be seen on the plane with the edge of the foramen magnum, which is nearly the relationship of the adult

palate. The choanae, likewise, exhibit changes indicative of palate descent. At birth the height of their cavities is about six mm., and the breadth a little more. At the first year it has doubled, at the second year its height has increased more rapidly and has changed from a circular to an oblong channel; at the seventh year its perpendicular axis is twice the length of the horizontal and has assumed at this early time the relative adult form.

DEVELOPMENT OF THE NARES.

We have said the nasal spaces increase in size by the downward growth of the hard palate.

Figure 5 shows section of a child's nasal space at the age of three years, having developed so that the maxillary portion represents one-third and the ethmoidal portion two-thirds of the nasal cavity. The mouth of the eustachian tube is on an even plane with the hard palate.

Figure 6 is a section of a child's nasal space at the age of three years, having developed so that the maxillary portion of the nares represents little more than one-third, while the ethmoidal portion occupies the remainder. The mouth of the eustachian tube is on an even plane with the hard palate

Figure 7 is a section of child's nasal space at the age of eight years, showing that the nasal chamber has developed so that the maxillary part equals that of the ethmoidal. The palate has grown downward and the eustachian tube is above the plane of the palate

In proof of this it may be seen that in the embryo the hard palate is above the level of the mouths of the eustachian tubes, while in the newborn it lies on an even plane, and later, about the eighth year, considerably below it. (See Figs. 5, 6 and 7.) The nasal space is lengthened by the growth of the pa'ate in the anteroposterior direction, and by the development of the alveolar process, which affords space for three molar teeth, and which has its beginning near the seventh year, to be completed at the time of full dentition. This development of the nasal space in the anteroposterior direction pushes the maxillary bone forward and causes the orthognathous face of the child to assume the more prognathous form. A notable development of the nares takes place with the eruption of the milk teeth, when the superior maxillary bone, which is very

vascular, increases in its dimensions and gives rise to the formation of the maxillary sinus.

Unlike other bones, those of the face are not developed from cartilage, but are produced within sheets of connective tissue, and are, therefore, spoken of as arising by intramembranous development. At birth the body of the superior maxillary bone consists almost entirely of the alveolar process, the sockets of the teeth being in contact with the orbital plate. However, the growth of the face takes place simultaneously with that of the maxilla by the formation of spongy bone between the alveolar process and the orbital plate of the maxilla, and in this way the alveolar process, along with the teeth, becomes separated from the orbital plate. Coincident with the increase in the cancellous tissue upon the facial and dental aspects of the bone, a process of absorption apparently takes place upon its nasal and orbital surfaces, which causes the formation of the sinus and the broadening of the nasal chambers. This simultaneous process of growth and absorption continues until the eruption of the wisdom teeth, at about the twenty-fifth year of life, when the antrum reaches its complete adult form.

THE TURBINATED BODIES AND NASAL MUCOSA.

These soft structures are under control of the vasomotor and cerebrospinal system of nerves, and are, therefore, capable of assuming (through the action of dilator and constrictor nerves) different degrees of turgescense in response to local stimulation of whatever nature. The membranes respond physiologically to meet variations of climate, and supply humidity, warmth and filtration to the air.

Figure 8 is Spalteholz's lateral section of the nasal chambers, showing the sphenopalatine ganglion nerve distribution to the turbinals, the anterior ethmoidal nerve to the mucosa, and the distribution of the nerve of smell.

In winter time the blood vessels of the membranes enlarge and supply heat sufficient to raise the temperature of cold air 12 degrees C., during the transit from nose to pharynx. Conversely, in summer time, during the hot weather, or by strong light, the nasal mucosa contracts to a thin membrane, while the erectile tissue maintains its normal state of partial venous congestion. During dry weather or in heated houses the mucous

membrane furnishes sufficient moisture to nearly saturate the air.

Figure 9 is a section of nasal mucosa from the floor of the nose, by Schiefferdecker, exhibiting the plasma channels, through which numerous leucocytes are passing. The first layer is of the columnar type, and below is represented the basement membrane, and the numerous canals which furnish lymphlike moisture in abundance, and few of which are seen perforating the basement membrane

The moisture is derived from the plasma channels that connect directly with the lymph system. While its source is probably the lymphatic system, and also the product of some special cells, its specific gravity is less than that of lymph fluid. The perforating canaliculi carry the fluid to the surface of the membranes in such liberal quantities that the structure is literally held in suspension. Especially is this true of the ciliary layer of the epithelium, which carries on its highly specialized activity under the same fluid, which possesses, besides a nutritive, also a bactericidal property.

The surfaces of the nasal membranes are constantly covered by a layer of mucus supplied from the mucous cells and the becherzellen and leucocytes. This layer of mucus entangles foreign bodies that are not arrested by the vibrissae at the entrance of the nose, and the dust and germs thus held by the sticky mucus are transported by the cilia waves towards the choanae. The cilia activity, aided by phagocytosis and the bactericidal plasma fluid, is important to nasal integrity—nearly sterile conditions being maintained within the nasal cavity. In 80% the nasal contents have been found sterile and only a few organisms were found in the remainder. When the cilia cells are destroyed by suppurative processes or by operative procedure, they do not replace themselves, but the squamous cell without cilia action is substituted.

The erectile tissue of the turbinated bodies is found on the anterior end of the lower and middle, and the posterior end of all three bones. Its circulation is contrary to that of the tubercle of the septum, composed of veins of thick coat, stronger than arteries, deriving its vasomotor control from the sphenopalatine ganglion. The glandular structure of the erectile tissue is so scarce that its function for supplying moisture is nil, but the mucous membrane supplying the

remainder of the nasal region has abundant glands for that purpose. The erectile bodies contain numerous large vascular spaces, forming a cavernous plexus, formed by the arterioles breaking up into capillaries. The venous sinuses thus formed have thick walls and contain much muscular tissue, which upon contraction empties these vascular spaces of their contents. The bone and membrane of the inferior turbinate are intimately connected, the nutrient blood vessels perforate the bone, so that in event of hypertrophy or atrophy both structures are affected alike.

Figure 10 is a histologic section of the mucosa of the middle turbinated body, by Schiefferdecker, showing the ciliated epithelium with the basement membrane. Leucocytes are seen traversing the intracellular spaces. The perforating canaliculi, carrying fluid to the epithelium, are represented by the clear channels passing through the basement membrane. The becherzellen, furnishing mucus, are seen between the long spaces in the region of the cilia layer. The leucocytes, represented by the dark cells, seem for a normal membrane to be in excess. The cellular activity of the cilia is carried on under fluid supplied by the plasma canals.

Figure 11 is transverse section of the lower turbinated body from the posterior end, by Schiefferdecker, showing the erectile tissue composed of arteries dividing into capillaries, and these in turn into veins, which form the large vascular spaces, also termed venous sinuses. The lowest line points where a vein is in communication with a sinus. The vascular spaces are veins, with coats stronger than arteries, and supplied with muscular fibers. The mucous membrane of the middle turbinated body is thinner and blends with the periosteum, while in the inferior region it is separated from it by a thick vascular layer.

The turbinated bodies, more especially their erectile tissue, and the tubercle of the septum have the function of regulating the inspiration by offering physiologic resistance, by their normally swollen and spongelike state, to each inspiration, thus affording sufficient time for moistening, warming and filtering the air. It seems probable that the lower and middle by their resistance retard expiration, and thus assist in maintaining a positive air pressure in the hypopharynx during expiration and aid in regulating the supply of residual air within the bronchial tree.

PROTECTIVE MECHANISM.

The architecture of the nose, its tortuous passages, with its moist mucous membrane and the erectile tissue of the turbinated bodies, together with the tubercle of the septum, are designed as a protective mechanism and favor the deposit of impurities of the atmosphere, such as dust and bacteria. The respiratory portion of the nose is provided with ciliated epithelium, which transports impurities towards the choanae. Nasal respiration modifies the air by moisture, warmth, and filtration, so as to render it practically sterile within the bronchial tubes and alveolar region.

The nerves of smell and taste combine to serve in the gratification of the sense of taste, the volatile substances of the food and drink reaching the olfactory region by diffusion during expiration. Zwaardemaker has well termed this the act of gustatory smelling. The olfactory and glossopharyngeal nerves in association constitute also a protection, acting as they do the part of a sentinel placed at the entrance of the alimentary and respiratory tract, giving warning of the approach of unwholesome food or unsanitary air. The sensory branches of the trifacial nerve aid in the protection against the ingress of dangerous gases or irritating air, by the involuntary closure of the nostrils, which is partly accomplished by the tubercle of the septum, an arterial erectile tissue, situated opposite to the anterior portion of the middle turbinate bone. Its situation is favorable for aiding the dilator nares in regulating the space for inspiration and by its engorgement to exclude irritating air from the nose. For that reason it has been referred to as a rheostat for the inlet of air.

THE NOSE AS A PATHWAY FOR AIR.

Atmospheric pressure acts on the body equally from all sides, and also in those internal air spaces which are in direct connection with the outer air, such as the respiratory tract, the sinuses of the frontal, superior maxillary and ethmoid bones. If such air filled space be closed off from the outer air for some time, rarefaction of the gases in the space occurs —it is followed by congestion of its membrane, as a result of the absorption of oxygen, and its replacement by a smaller

volume of carbon dioxid. The air pressure in the nasal cavity during inspiration is negative, and contrarily, during expiration it is positive. In slight deformities of the septum and other structures of the nose, the air currents, creating alternating states of rarefaction and condensation of the atmosphere within the nose, easily become factors in begetting and maintaining acute and chronic states of inflammation, by partial or complete closure of the nasal lumen and the orifices of the sinuses or that of the lacrimal duct. The inspired air takes an upward curved direction into the middle and superior meatus, it traverses the olfactory region to descend toward the choanae.

Figure 12 shows Paulson's schematic representation of the pathway of air during inspiration. Partial vacuum having been created within the lungs, the zone of rarefaction extends to the upper air tract, hence inspiration takes place under negative pressure. Thus the main air current influences the inspired air to take an upward curved direction toward the middle and upper meatus, traversing the olfactory region to descend to the choanae.

In its passage the air meets resistance offered by the tubercle of the septum, the erectile tissues of the turbinates and the mucous membranes of the nose, the resistance of which is sufficient to keep the air within the nasal cavity long enough to be modified.

The investigations of Kayser and Schutter reveal that there is but little difference, as far as heat and moisture are concerned, between the air inspired through the nose and that inspired through the mouth. Schutter found the air of the nose has a temperature of 33 C., and that of the mouth 32 C., and that the air of both shows a humidity of 7-9. Saturation and blood temperature of the inspired air is attained only when it reaches the bronchial tubes, this being accomplished by the glandular and vascular tissue of the oropharynx, pharynx and trachea. Thus the usually accepted theory that the nose alone serves to heat and moisten the inspired air is not borne out by experiment. While in mouth breathing, or through a tracheal canula, the air may be sufficiently moistened and warmed, it must be clear that it cannot be purified as in nasal breathing. Normally the expired air is under positive pres-

sure and is completely saturated with moisture of blood temperature and contains CO^2 gas, and is 11% more voluminous than the inspired air. Unlike the negative air currents of inspiration, it does not rise, but chooses the path along the floor of the nose, there being no rarefied air currents to deflect it.

Experiments appear to corroborate the pathway. A particle of wool placed in the middle and inferior meatus yielded readily by a forceful expiration from the lower, but with difficulty from the middle meatus. The expiratory current thus meets the inferior turbinated body, which in its swollen state offers resistance to its free escape, aiding in air storage in the nasopharynx. Normally the inspiration is initiated by the descent of the diaphragm and the contraction of the chest muscles creating a partial vacuum in the lungs. By its proximity, the air nearest the zone of rarefaction is first to move, hence the air in the bronchi, the trachea, the nasopharynx, and from the middle of the nose descends before the atmospheric air gains access to the nose.

The inspiratory current, normally, is of negative pressure, which induces suction upon the accessory sinuses, and they partially empty themselves of air, producing rarefaction in all the sinuses, which, however, is equalized at the end of each inspiration to atmospheric pressure. The full inspiration being completed, expiration ensues under positive air pressure, practically in the entire air tract. The fluctuations of air pressure differ considerably.

According to Mink, of Holland, the normal during quiet inspiration is 10 mm., water negative, in the trachea; 8 mm. in the nasopharynx; 6 mm. in the middle nose and sinuses; 4 mm. in the prechoncal space and 2 mm. in the vestibule. Normal expiration is carried on under positive pressure, and the manometer registered 10 mm. water below the glottic region; 8 mm. water in the nasopharynx; 6 in the turbinal region; 4 in the preconchal space and 3 in the vestibule of the nose. If the mouth be open, then the pressure, either negative or positive, is equalized in the trachea or pharynx. Careful experiments by Mink reveal the interesting fact that when turbinates are contracted by cocain, the air pressure is reduced from 8 mm. to 4 mm. water.

Figure 13 is a diagrammatic illustration of the pathway of

the air through the nose, during expiration, after Mink, of Holland. The chamber represents the nasal cavity, b, its outlet, while c, and a, constitute an imaginary inlet and forced expiration. When tobacco smoke is gently forced into the tube, a, it is seen to move in a direct line to b, along the floor to the outlet. When, however, greater force is employed in blowing, various sizes of whirls of smoke are formed, proportional to the force. Expiratory currents of air under positive air pressure descend to the floor of the nose, while inspiration under negative pressure ascends proportional to the suction.

The same relation of air pressure exists in atrophic catarrh. This observation seems to indicate a physiologic function of the turbinated bodies, especially the inferior, namely, that by the swelling of the erectile tissue, a resistance is offered to expiration, which aids in maintaining a storage of residual air under positive pressure in the nasopharynx.

Figure 14 is a graphic illustration of the air pressure within the nose during expiration, by Mink, of Holland. When the turbinated bodies are contracted by cocain, the air pressure is reduced from 8 mm. water to 4 mm. water, revealing the physiologic significance of the swollen turbinates of maintaining a positive air pressure equal to 4 mm. water in the nasopharynx.

The spongy tissue thus assists in equalizing the amount of expired air in a unit of time, irrespective of the depth of the preceding inspiration. It may be said that the turbinates are an auxiliary to the function of the glottic constrictors, that of protecting the lower air passages, as well as maintaining automatically at all times the required amount of air in the respiratory tract for the purpose of oxygenation. The adaptability of the turbinates thus appears to have an influence in regulating the lumen of the nose, keeping up a reciprocal relation with the automatic center, which presides over the demand for oxygen for the body as a whole.

ACCESSORY SINUSES.

The accessory sinuses act in an esthetic sense as subsidiary resonators. Together with the nasal fossae they impart quality (timber) and resonance to the singing and speaking voice. The vocal effects of sopranos and contraltos differ in timber. The soprano is found to possess more often the narrow and

contracted facial structure,—the dolychocephalic head with small sinuses, while the contralto has the broader face with larger accessory sinuses—the brachycephalic structure. The proximity of the cavities to the olfactory region gives rise to the theory that they aid the olfactory nerves in perception of odors. Paulson experimented to this end, and concluded that in the process of smelling, the forced inspiration sends branches of the main current of air into these various sinuses, and by diffusion aids in the perception of volatile odors.

Luschka looked upon the accessory sinuses as the reservoirs for the heated and moistened air. Actual measurement by Braune and Clasen showed that the capacity of all the sinuses was only 45 ccm. It is evident that this small amount of air as a carrier of warmth and moisture would have no effect on a current of air of at least 500 ccm. It was also thought that the cavities might have some effect on the direction of the air current during inspiration, but Paulson held that the cavities had no influence and showed that the rarefied air current within the upper part of the nasal chamber had some influence in drawing the air to the middle and superior meatus.

Figure 15 is an apparatus devised by Vohsen, of Munich, to demonstrate the ventilation process of the accessory sinuses by the nasal air currents. The apparatus is made of glass, with a soft rubber tube attachment, and a glass globe-shaped bottle, hermetically sealed, with an outlet into the glass chamber, d. By slight suction upon the soft tube at a, the niveau 6c is seen to slowly descend, simultaneously a few drops of the liquid escape at the funnel d. When the tube is released, the atmosphere at once rushes in at a, and finds its way through the funnel a, and passing through the liquid ascends to the space above the liquid 6c, which again causes a few drops of water to escape through the funnel d. The glass chamber represents the nasal space, the glass bottle represents the sinus and its orifice, the suction through the tube may be imagined to take the place of the negative air current, which causes a slight syphonage of either air or fluid.

The ventilation of the sinuses is influenced by the inspiratory currents of the nose, which being negative in pressure, causes syphonage through the orifices. At the end of each

inspiration, however, the negative pressure of air in the sinuses is equalized by a sudden inrush of air to atmospheric pressure. Thus the sinuses, like the entire tract, undergo fluctuations of air pressure, changing with each inspiration and expiration from partial negative to atmospheric and then to partial positive. Their mucous membrane is continuous with that of the nose, but considerably thinner in the maxillary and frontal, and thinner still and less adherent in ethmoidal and sphenoidal regions. Their resistance to disease is less than that of other tissues, but being supplied with periosteal nutritive layers on both sides of their bony walls, rapid necrosis and formation of fistulous tracts are prevented. The mucous membranes are lined with cilia, whose activities sweep secretion toward the orifice into the nasal fossa. The membranes around the orifices are loosely adherent and tend to form folds which easily become obstructing by inflammation.

OLFACTION.

We live in a world of light and sound, but also in one of odors, says the renowned investigator Zwaardemaker, in his book on the Physiology of Olfaction. The truth of this statement is evident when our attention is called to the fact that nearly every organic body of the animal and plant kingdom has its characteristic odor. The human olfactory organ is said to be in a state of retrogression and has lost some of its original power of perception. It is related by M. Fee that some of the lower human races have retained some of their acuteness of smell that is possessed by the lower animals, and are able to anticipate the approach of and to classify their enemies by the sense of smell.

With the diminished sense of smell, the human being is still marvelously influenced by the pleasurable and the disagreeable odors conveyed by the air. The one imparts a sense of pleasure and of well being; while the other produces disgust and even illness. The pleasurable effects are accomplished reflexly through the stimulus being conveyed by the olfactory nerves alone, or in association with the sensory branches of the trigeminus to the vagus, which responds by increased function of respiration and circulation. Unpleasant odors, irri-

tating substances, or strong electrical currents exhibit the reverse effect and produce either decreased or transient arrest of the functions of the heart and lungs.

NASAL REFLEXES.

The nose is endowed with nerve ends which have the capacity of setting in motion and of receiving a variety of reflex stimuli. Its intimate association with the sympathetic and central nervous system permits of the establishment of vasomotor reflex paths, which link the nasal organ with remote parts of the body.

A most intimate relation exists between the nasal nervous mechanism and the nerves regulating the action of the heart and lungs. The earliest investigator, Johannes Muller, announced that the respiratory apparatus, through its nerves, could be reflexly affected by a stimulus applied to the surface of the mucous membrane of any part of the body to such an extent as to cause not only convulsive movements, but also pathologic processes.

Modern physiologists have narrowed Muller's very wide interpretation of reflex action of the nose and the respiratory apparatus. A normal reflex effect demands, as its name "Reflexion" implies, a return or bending, hence a true reflex action consists of a peripheral stimulus traveling towards the centre (centripetally) along a nerve end, returning centrifugally towards the periphery. A reflex may be initiated from any part of the nasal membrane, but most effectively through the erectile tissue of the turbinated bodies. The sensory nerves of the nose are derived from the trifacial, and they are responsible for the physiological reflexes of the nose that are positively established, such as sneezing, coughing, spasm of the glottis, expiratory spasm, vasomotor, dilatation and constriction of blood vessels.

Nasal reflexes consist of three varieties and effects.

1. A peripheral stimulus of the sensory nasal nerve most frequently produces a dilatation of the vessels of the nose, seldom contraction.

2. Peripheral stimulus of a sensory nerve of the nose will be followed by a dilatation of the blood vessels of the head, while the reverse, a contraction, takes place in all other parts of the body.

3. Stimulus applied to sensory nerves of remote organs may either dilate or contract the blood vessels within the nose.

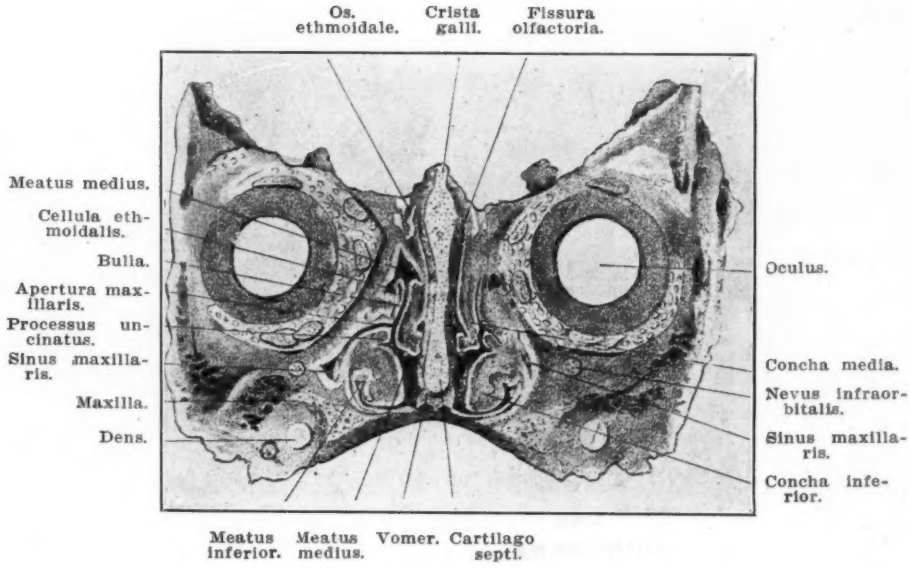

FIGURE 1

FIGURE 2.

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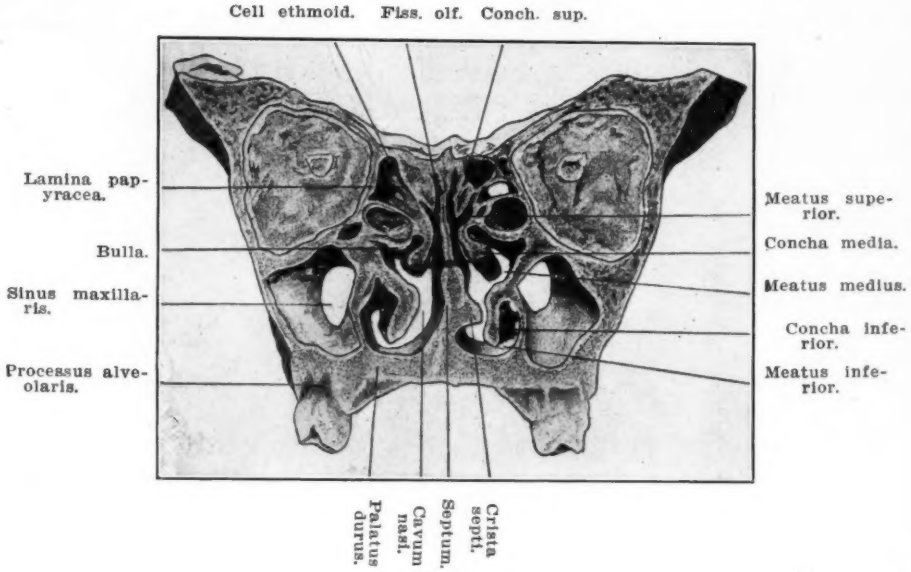

FIGURE 3.

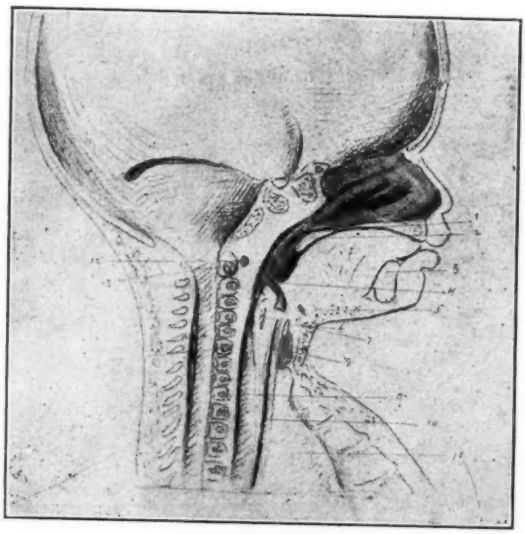

FIGURE 4.

1. Ostium pharyngis tubae.
2. Velum.
3. Maxilla inferior.
4. Epiglottis.
5. Os. hyoideus.
6. Cartilago thyreoideus.
7. Cartilago cricoideus.
8. Glandulae thyreoideae.
9. Esophagus.
10. Trachea.
11. Glandula thymus.
12. Atlas.
13. Epistropheus.
14. Vertebra septima.

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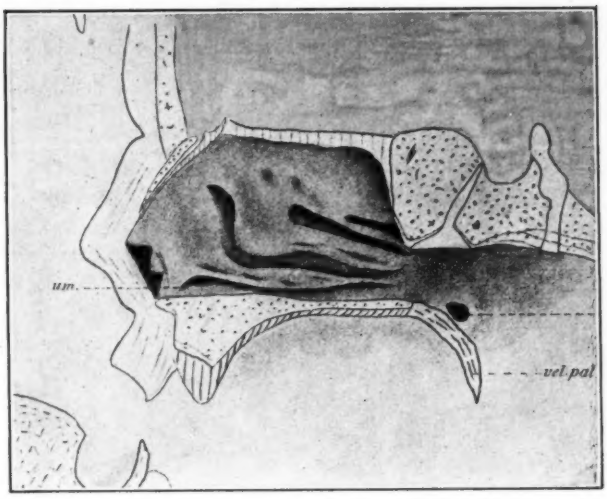

FIGURE 5.

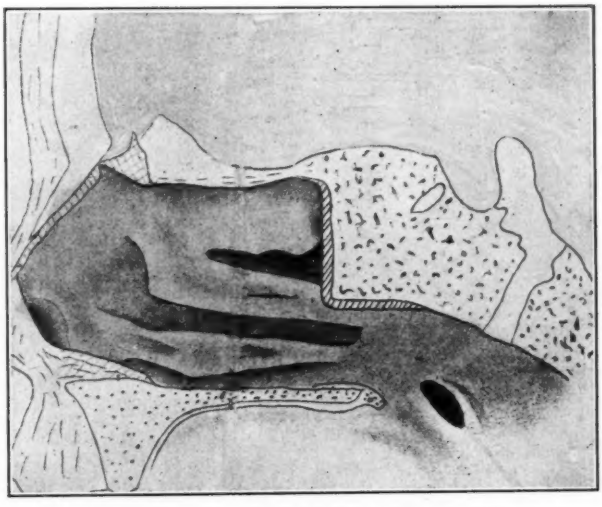

FIGURE 6.

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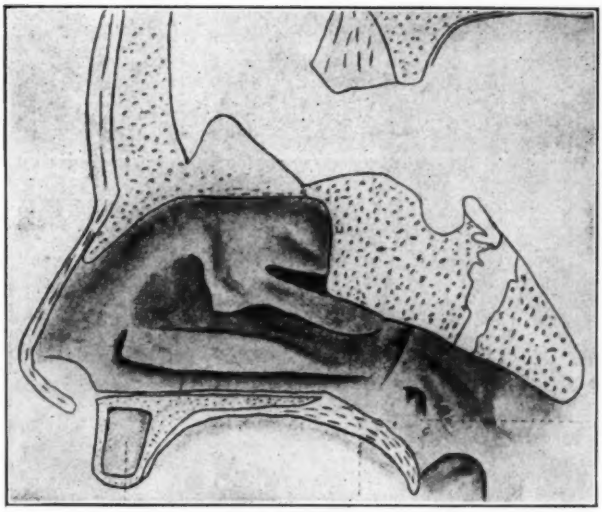

FIGURE 7.

FIGURE 8.

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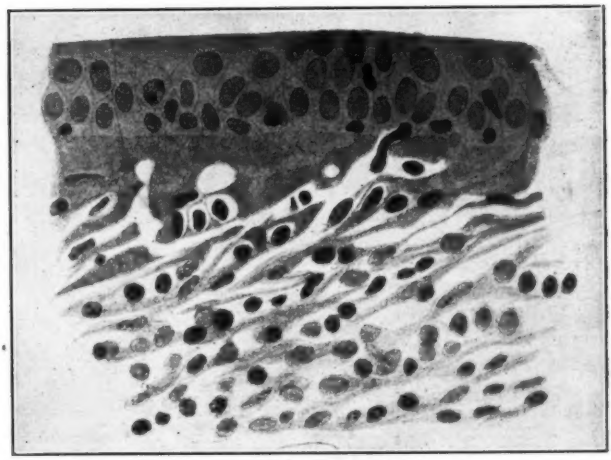

FIGURE 9.

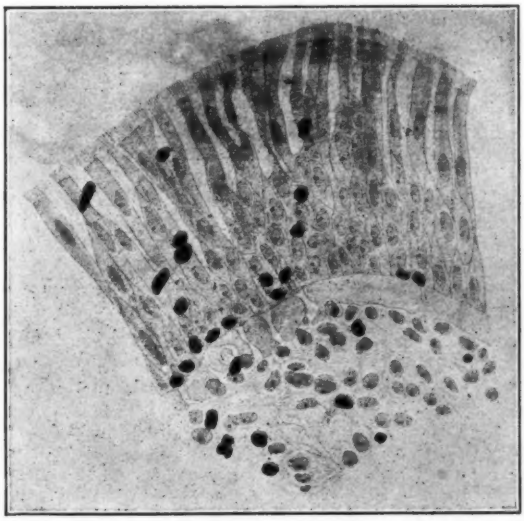

FIGURE 10.

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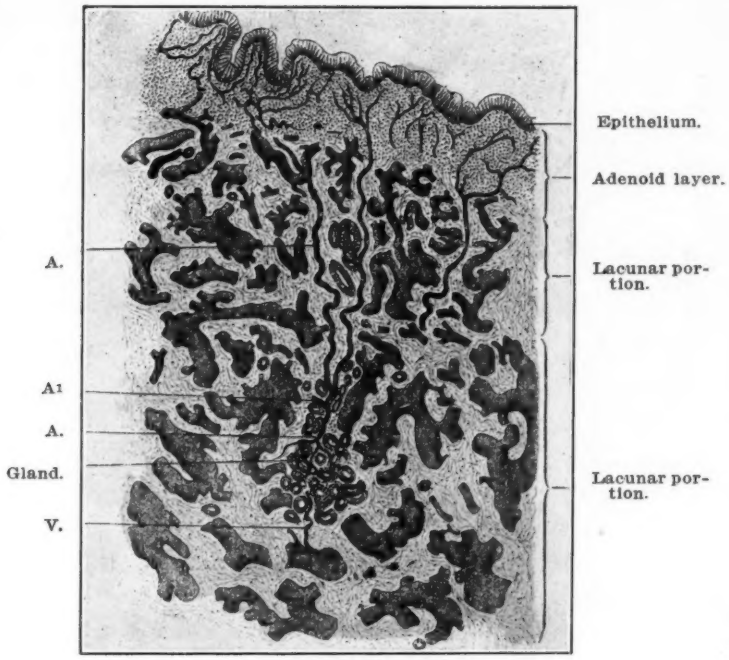

FIGURE 11.

A represents branches of artery, perforating at A^1, which break up into capillaries in the adenoid and epithelial layer of the mucous membrane. V shows an artery communicating with one of the vascular spaces.

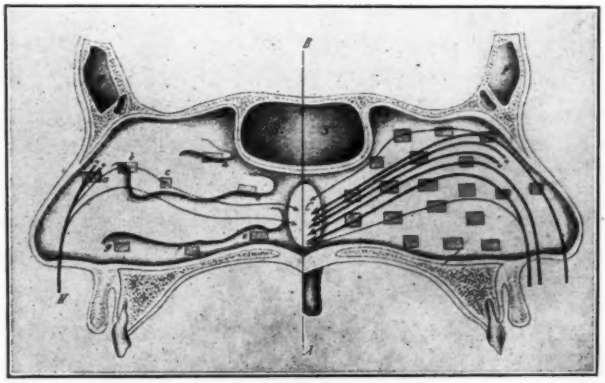

FIGURE 12.

C. Choana.
A.B. The axis.
F.F. Sinus frontalis.
S.S Sinus sphenoidales.

The square fields indicate where litmus paper is placed to determine the path of air.

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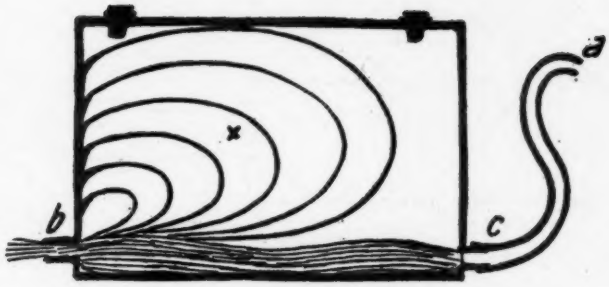

FIGURE 13.

a. Soft rubber tube atachment.
c. Opening into chamber.
b. Outlet of chamber.

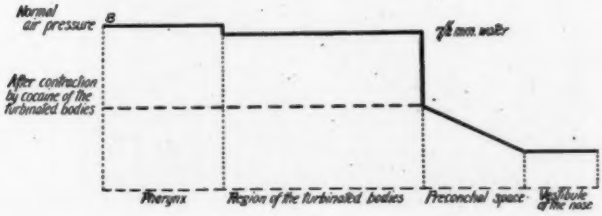

FIGURE 14.

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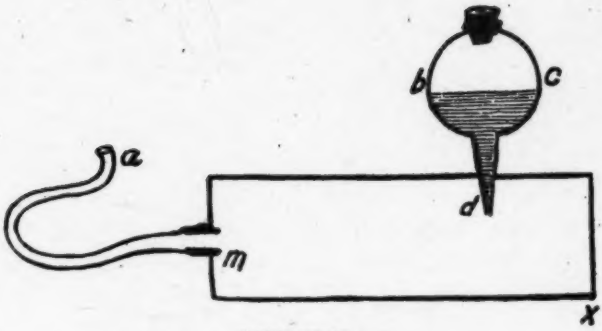

FIGURE 15.

a. Soft rubber tube.
b.c. Niveau.
d. Opening into.
m. Glass chamber.

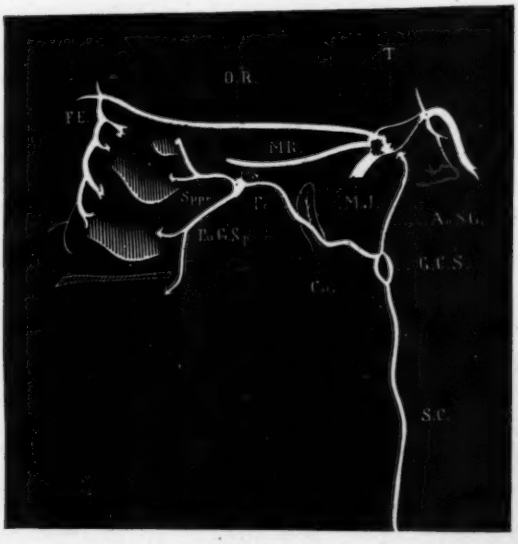

FIGURE 16.

Diagrammatic representation of the communication of the three divisions of the fifth or trifacial nerve and branches, with the sympathetic nerve and the gasserian, the sphenopalatine and superior cervical ganglion. These nerves serve to establish a vasomotor reflex path between the nasal organ and remote paths. (By Francois Franck.)

T. Trigeminus or trifacial nerve.
O. R. Ophthalmic division.
F. E. Ethmoidal nerve supplying the mucosa.
M. R. Superior maxillary division.
G. S. P. Ganglion sphenopalatinum.
S. C. Sympathetic nerve.
G. C. S. Ganglion cervical superior.
An. S. G. Connecting the sympathetic nerve with the Gasserian ganglion.
M. T. Inferior maxillary division.

L.

THE PRESENT STATUS OF THE TONSIL OPERATION: A COLLECTIVE INVESTIGATION.*

By George L. Richards, M. D.,

Otologist and Laryngologist to the Fall River, Union and St. Anne's Hospitals,

Fall River, Mass.

This paper is based on 130 replies to a series of questions addressed to prominent laryngologists in this country and Europe, and on such of the recent literature as covers certain of the same points concerning which information was requested.

The questions to be considered are: the physiologic function of the tonsil, the use of chemical caustics in its treatment, its relation to tuberculosis and the cervical glands, its relation to rheumatism, indications for its removal, the choice of operation, the necessity of re-operation, present technic, and the question of hemorrhage connected with the operation.

I wish to express my thanks to all those who so carefully and conscientiously replied to my questions. I regret that the length of the paper precludes the possibility of giving them all individual credit. Certain of them will be referred to by name, and the results of the work of all will be found incorporated in the body of the paper.

I have commented somewhat on the various opinions and stated my own views, which I wish to qualify in advance by the statement that as the arc of the circle which any one man's experience subtends is necessarily small, too much weight must not be given to any one person's opinion until experience has proved or disproved its value.

---

*Presented before the American Laryngological, Rhinological and Otological Society at its annual meeting held in Atlantic City, N. J., May 31, June 1-2, 1909.

PHYSIOLOGY.

Only 77 attempted to answer the question "What is the function of the tonsil?" in any way whatsoever. The general tenor of these answers seems to show that few laryngologists have troubled themselves very much about the physiology of the tonsil or its value as an organ in the throat, being mostly concerned with its removal or treatment when manifestly abnormal. Having discovered that apparently its removal in no sense prejudices or endangers the life of the individual, but, on the contrary, that most cases of removal have been to the decided advantage of the individual, they have assumed that its value in the normal physiologic economy is practically very slight, whatever it may be theoretically.

Thirty-four considered the tonsil of value when normal, as an arrestor of the entrance of pathogenic organisms. In early life it assists leucocytosis and gives off phagocytes, but when diseased it loses its function and serves to spread disease. Seven considered it as a lymphatic gland of no special function, and nine as a producer of white cells when in a state of health. Ten considered that it has no further function or any physiologic value; four that it secretes an antitoxin and furnishes moisture to assist deglutition in the throat, and five considered its function unknown.

Goodale considers the function of the tonsil to be identical with that of the cervical lymph nodes, of which it is the distal unit. He regards the tonsils as constituting protective organs, not in the sense of themselves producing phagocytic leucocytes, but rather as representing unusually open channels of communication between the interior of the organism and its exterior, along which polynuclear leucocytes make their way from the blood vessels to the surface of the mucous membrane[1]. In normal tonsils, both of men and also animals, large mononuclear phagocytes are present, which appear to be derived from a proliferation of the endothelial cells of the reticulum[2].

Price Brown, of Toronto, considers that the tonsil is probably of the same nature, though not the same, as the thyroid and thymus glands, effecting some change in metabolism.

Dr. Jonathan Wright very kindly replied somewhat in detail to my question as to the physiologic function of the tonsil, and as he has given considerable attention to the subject, I pre-

sent in very nearly his own language his views, quoting from recent papers as well as from his personal communication:[3-4]

"It is a very definite organ, and in the human race is the most highly developed of all the lymph glands, having an extent and a complexity, considering the whole faucial and laryngeal ring, entirely in excess of any other local aggregate of lymphoid tissue, except the spleen.

"If its normal state is one of comparatively little obstruction to the passage of food and air, such a condition varies between wide limits of volume, and it is impossible to draw any line between the minute structure of the normal and that of the abnormal in size.

"The enlargement becomes pathogenic, or less accurately pathologic, only when it injures the system more by its presence than it assists in whatever physiologic acts of assimilation or defense it may have to perform.

"Many large tonsils exist from childhood to old age without in the least being either a source of danger or even of inconvenience. Their existence, even when originating in temporary disturbance of the organism (inflammation?) may not subsequently be a menace to health.

"Of course, they may and frequently do reach such a size as to injure the patient's health. From their size they may really cut off the proper air supply; the irritation of their presence in the fauces may excite constant hyperemia and paresthesia, etc., but all these classical symptoms by constant iteration have been much exaggerated. There are a large number of children, especially in the country, who are never inconvenienced in the slightest by moderately projecting discrete faucial and pharyngeal and lymphoid hypertrophies.

"The pits of the tonsils are retorts in which the germs are either destroyed or modified so that they may live at peace with their host, or they are allowed to pass through only in such numbers as can be dealt with by internal processes without the destruction of the host.

"From various clinical facts, it seems likely it is the small, sunken, ragged tonsil, and not the large tonsil, which lets through the dangerous germs.

"Whatever may be the conclusions as to their marked enlargement, the knowledge derived from all these sources and the experimental evidence unite in pointing to the function of

the tonsil as one of defense against infection. The tendency to enlargement seems a persistence of the process by which the function was evolved.

"It has been shown that dust or inanimate matter passes through the tonsillar epithelium. It has been shown that oil globules, at once saponified when applied, also readily pass. It has been shown that bacteria of the same size as the dust and oil globules do not readily pass, though constantly in contact with the epithelium of the tonsillar crypts It has been noted that dust (carmin) particles when applied, pass through the layer of bacteria on the surface and on into the tonsillar structure without carrying in any of the bacteria. Yet we know that under certain conditions bacteria, especially the pathogenic bacteria, do pass through the epithelium of the tonsils and of the intestines. I have attempted to show from collateral evidence that this action probably arises from the difference between the potentials of surface tension of the epithelial cell on the one hand, and that of the bacterium and the dust particle on the other. Since one is a living colloid state of matter and the other is so-called inert matter, we could hardly expect any other experimental result than has been obtained. How has this distinction arisen in the animal organism? I have attempted to show that the one kind of matter being often harmful and the other kind of matter usually harmless, evolution, by natural selection or otherwise, has stepped in, and in the phenomena exhibited by the tonsil we find evidence of its influence.

"The experiments of Loeb furnish a possible physical explanation of just how the difference of potential comes about, whereby at one time the streptococcus or the staphylococcus pyogenes, for instance, is excluded and at other times (cold taking, infection, etc.) is allowed to enter. For, knowing as we do that these germs and perhaps others are more or less constantly found on the surface of the tonsil when in health, and beneath the surface in disease, we must have some sort of an explanation of how this surface tension may be made to vary."

In Dr. Wright's personal communication he states that he does not think we can speak of the function or the physiology of the tonsil in the usual acceptation of the meaning of these terms. He attempts to discuss not the function or the physi-

ology of the tonsil, but rather the part it plays in the process of infection and immunity. He says, "It seems hardly possible to explain the selective action of the tonsillar epithelium upon dust and upon bacteria, at times preventing the latter from passing and at times allowing them to pass into the lymph channels, from laws revealed by the usual work on immunity. This is almost exclusively concerned with what happens to the bacteria after they come in contact with internal body fluids. The problems belong chiefly to biophysics. Consequently, it seemed necessary that the dynamic phenomena exhibited in the process of absorption of bacteria from the surface of the tonsil should be studied in the same way as we study other phenomena of osmosis, but evidently we have here to do with living matter which obeys the laws of heredity and evolution, and if these are left out of account, the solution of our problem is hopeless.

"For instance, a bacteriolysin might perhaps destroy bacteria after they pass the epithelium, though the microscopic evidences are not suggestive of this; but no bacteriolysin can explain why they pass in or why they are kept out. This, which is at the very beginning of all we want to know, has been all but completely neglected in the work on immunity.

"Adaptation by natural selection or otherwise must eventually occur to one as the explanation why the protoplasm of the cells of the epithelium of the tonsillar crypts acts in the way it does. The colloid of cells is in the colloid state by virtue of the surface tension on the molar or molecular masses of protoplasm of which they are made up. The same is true of the bacterial cells lying in contact with the cryptal cells."

George B. Wood has published several papers on the histology and physiology of the faucial tonsil. In his latest paper he states that the faucial tonsil is covered by stratified squamous cells, the structure of the tonsil resembling somewhat that of a lymph gland, differing, however, in that it possesses no afferent lymph vessels and no periglandular sinuses, and does possess those peculiar structures, the crypts or lacunae. The crypt of the tonsil is its most peculiar and characteristic structure, and consists of an invagination of the surface of the epithelium, which has undergone a very interesting anatomic change The subepithelial connective tissue which exists beneath the surface epithelium, disappears as

soon as the epithelium starts to form the crypts. This permits the epithelium to come into direct contact with the lymphatic structure of the tonsil, and very frequently it is impossible to distinguish a dividing line between the epithelium of the crypt and the interfollicular tissue. This epithelium does not form a compact, unbroken barrier of protection. For the greater part of its extent it presents an intact line, possibly three cells in thickness, and there are occasional spaces between these cells.

In the crypt, then, we have a loose disintegrated epithelium which, so far as any mechanical barrier is concerned, presents an open door to microbic infection, and it has been shown that minute inert foreign bodies readily pass between the cells. In the faucial tonsils the gross arrangement of the crypts is such that frequently they form pockets and recesses capable of retaining large numbers of bacteria which find plenty of nourishment in the desquamating epithelium.

Hence, it would seem that unless the vital resistance is considerably greater in the tonsil than in the surrounding structures, the tonsillar tissue ought to be the vulnerable spot in the throat. This being the case, it was thought possible that there might be developed in the tonsil certain antibodies which would make this structure especially resistant to germ invasion. Experiments to determine this were carried out, but they resulted in failure to find immune bodies in the tonsil, due either, Dr. Wood states, to a lack of sensitiveness in the technic, or to the simple fact that the reasoning concerning this subject has been false, or it may be that soluble substances are so easily removed by both the blood vessels and lymph channels that immune bodies as well as the toxins and antitoxins cannot accumulate in the tonsil. The blood supply of the tonsil is fairly rich, and the efferent lymph stream is a decided entity, so that a soluble substance could probably not remain long in the tonsillar structure. The rapid and marked systemic intoxication seen in cases of simple tonsillitis shows that some toxins, at least, are readily absorbed from the tonsil into the general circulation, and it is more than probable that the first general symptoms are due to toxic absorption through the blood vessels. The slowness of the lymphatic method of infection is shown by the fact that enlargement and tenderness of the tonsillar lymph gland at the angle of the jaw

is not always present in simple tonsillitis, and is almost never present at the very beginning of the attack. This failure to find any considerable amount of immune bodies in the tonsillar tissue as has been indicated, leaves us still uncertain as to the degree of vital resistance of the tonsillar structure.

As the lymph chain of the neck presents a rather formidable barrier against the invasion of microorganisms, the large majority of patients suffering from microbic infection of the tonsil pass through the disease without any true bacteremia[5].

F. H. Bosworth has contended for many years that the tonsil is not a physiologic organ but a diseased process which practically constitutes a morbid growth or tumor, and should be thoroughly removed in the same manner as any other tumor, whether it be fibroid, malignant or any other[6]. In his answer to me he adds: "Incalculable miscief has resulted from the early anatomists describing it as a normal organ of the body."

In accord with this is the observation of Spohn that in the throat of the healthy child there are practically no tonsils. He examined one hundred infants soon after birth, and not one had a tonsil that was perceptible. There was no elevation, not even a roughness between the pillars of the fauces[7]. This observation, being made by the sense of touch only, can not be considered as definite, as the tonsil may be so small in the infant as not to be evident to the sense of touch or sight.

On the other hand, the anatomic work of Mosher, based on the examination of embryos of four, five, six and seven months and full term infants effectually disproves the statement that the tonsil is absent at birth. The reason that it is overlooked in the newborn child may be due to its position, since at birth the tonsillar opening and the tonsil are practically horizontal, and at such time the tonsil is more a part of the palate than of the wall of the pharynx. As the face grows downward, the tonsil also grows downward, forward and inward[8].

DIRECT OR APPARENTLY DIRECT RELATION BETWEEN ENLARGED CERVICAL GLANDS AND THE TONSIL.

One hundred and seventeen personal reports were positive as to this point; namely, that there is a direct relation between the two, the tonsil being apparently the gland through which the infecting agent comes, as evidenced by the cessation of the adenitis after removal of the tonsils.

Five observers did not know of any relation between the two. This statement is the more remarkable, considering the fact that two of the observers, Professor Chiari and Seth Scott Bishop, are men of large experience, and it would seem that the import of the question must have been misunderstood by them, as it would seem hardly possible that they have never seen cases of cervical adenitis which were apparently of tonsillar origin.

The anatomic investigations of Poirier and Wood have shown that the lymphatic drainage of the faucial tonsil runs directly to the upper deep cervical glands, which glands by a rich system of anastomosis are connected by efferents and afferents with practically all the lymph glands of the neck and head. The tonsillar lymph gland is generally situated just below the posterior belly of the digastric where it crosses the anterior border of the sternomastoid. This spot is located just behind and below the angle of the jaw, and in tuberculous adenitis of the neck it is this gland which is almost invariably the first one to become enlarged, the others being involved subsequently[9].

It would seem, therefore, as though this question had been sufficiently determined to admit of this relation being stated as a positive fact. That following the removal of the tonsil there may be in some instances—as was stated by two or three reporters—at first an enlargement of the immediate glands, followed later by their subsidence, is an undoubted fact, and has been observed by me on several occasions. This is easily accounted for by the traumatism from the operation, with the resulting direct absorption for a short time of more or less material from the throat and consequent gland enlargement. The observation made by Chambers, that infected cervical glands are always accompanied by large tonsils, is hardly warranted. On the contrary, the investigations of Jonathan Wright and Lee M. Hurd have shown that in some cases of cervical adenitis the tonsil itself may be quite small and belong to the submerged type.

Goodale has treated cervical lymphadenitis by the introduction of medicinal substances into the tonsils, and has proved the ability to reach the angular lymph glands in this manner. In one of his cases there was a steady diminution in the size of the gland, which had previously been increasing in size,

while the tonsils themselves appeared to be essentially normal[10].

R. B. Canfield says that enlargement of the cervical glands is one of the general indications for the removal of the tonsils, and this has been my experience; so much so that in all cases of this kind where possible I have the tonsils removed as a part of the treatment for the enlarged glands.

Albert E. Rogers says that the surgeon should first extirpate the tonsil before resorting to an incision through the skin in all cases of cervical adenitis which have not already broken down[11].

Griffin states that the person who has a tonsil at birth will always have enlarged cervical glands or enlarged glands elsewhere. The truth of this statement would seem to be doubtful, as, in spite of various statements to the contrary, it is probable, from the testimony of the best observers, that the tonsil is always present at birth. It is also equally true that there are a great many persons who have enlarged tonsils who do not have enlarged cervical glands. Enlarged cervical glands are probably caused by or are the result of infection from or though diseased tonsils, but not all persons who have diseased tonsils have enlarged cervical glands, since the gland not infrequently has sufficient resisting power to ward off the infecting process from the tonsil.

CONNECTION BETWEEN THE TONSIL AND TUBERCULOSIS.

Fifty-seven had no knowledge of any connection between the two, while 39 had. The others did not answer the question. Goodale has seen several such cases, already reported. Hurd reports seven cases out of nine in which the clinical diagnosis of tubercular tonsillitis was made, mainly from the condition of the cervical glands, and in which Jonathan Wright found evidence of tubercle bacilli in the tonsils. In one case out of ten in which the clinical diagnosis was simple chronic inflammation of the tonsil, Dr. Wright found tuberculosis evident in the tonsil. He thinks the tubercular cervical glands at the angle of the jaw are almost always secondary to primary tuberculosis of the tonsil.

Dr. Hurd and Dr. Wright have recently made further investigations which show that the larger and freer the tonsil the more it resists the invasion of harmful organisms; also

that it is exceptional to find associated with such a tonsil much enlargement of the lymphatic glands The small submerged tonsil is much more likely to be the soil for invasion of the tonsil with tuberculosis. Dr. Wright examined the tonsils in sixty cases where the protruding portion only was removed, and did not find tuberculosis in any of them.

The tubercular tonsil is usually pale, the crypts contain cheesy debris, and the edge of the anterior pillar shows passive hyperemia, and the associated lymph glands are enlarged. The stump of the partially removed tonsil is quite as liable to tubercular infection as if originally submerged.

The examination of the tonsil is difficult as to the diagnosis of tuberculosis, since spots of granular protoplasm representing tonsillar regression are accompanied by a grade of fibrous tissue such as is found in old healed tubercular areas at the apex of the lung.

George B. Wood found that tubercle bacilli passed through the tonsil to the lymph glands five days after inoculation of living tubercle bacilli in the guinea pig, showing that even while in an apparently normal state the tonsil is unable to filter out living tubercle bacilli[13].

Koplik regards the tonsil as the source of infection when the lymph nodes are found to be the seat of isolated tubercular infection of a primary nature. Isolated tuberculosis of the tonsil is very rare. The infection may occur during the act of swallowing[14].

Swain voices a somewhat different opinion, in the statement in answer to this question, that the lateral column of the pharynx, all of its postnasal surface, and the pharynx, can and do contribute lymph in inflammation of the neck, and says that if he were to have any deleterious matter absorbed, he would rather have it go through the tonsils, where a host of phagocytes live, than any other less protected place.

Theisen has had cases in which examination of the removed tonsils showed the presence of giant and tubercular cells in the tonsillar tissue. The children from whom the tonsils were removed had enlarged cervical glands, yet the examination of the lungs was negative.

Lermoyez regards chronic lesions of the tonsils as an open door to tuberculosis.

Thompson advised the removal of diseased tonsils in an

adult woman, which was refused. She returned two years later for the removal of the tonsils and a large mass of tubercular glands in the neck. Recovery took place. There was no tuberculosis anywhere else in the body.

E. L. Shurley reports, on the other hand, that according to his observations there are very few cases of tonsillar tuberculosis, and he has seen but few cases where any causal relation could be even suspected.

Professor Chiari says that primary tuberculosis of the tonsil originates either through the air passages or through the ingestion of tubercular milk. It is possible for the tuberculosis to extend from the tonsil to the entire body. He has not had the opportunity, however, for direct observation of this.

Moure, of Bordeaux, does not believe that the tonsils are very often the starting point of tuberculosis.

Solenberger says that in Colorado there as so many cases of reinfection, not a few after an attack of acute tonsillitis, that he is forced to think there is a causal relation between the two. In several hundred cases of tubercular patients, 62 per cent have had tonsillitis at intervals from childhood and severe attacks of swollen cervical glands.

From all of which somewhat conflicting testimony, it would seem that the question of the entrance of tuberculosis germs through the tonsil has been definitely determined by a sufficient number of careful observations to render the fact an undisputed one, even though only a minority of observers have reported thereon. This, taken in connection with the results in cervical adenitis, would seem to give a sufficient reason for excising the tonsil whenever there are any symptoms suggestive of possible incipient tuberculosis or cervical adenitis. I have to admit that I have myself no direct knowledge of general tuberculosis where examination of the tonsil has proved the presence of either giant cells or tubercle bacilli, but I am firmly convinced that such relation does exist.

THE RELATION OF THE TONSIL TO RHEUMATISM.

The relation of the tonsil to rheumatism is one of the as yet unsolved problems to which considerable attention is being given. At the outset of such an inquiry one is confronted with the question as to what rheumatism is, and on this ques-

tion there is as yet no unanimity of opinion. The older theories as to dependence on cold or wet and the uric acid theory seem about to be superseded by the theory of direct infection. Sufficient proof is perhaps not yet at hand to make this a certainty, but the tendency is all in this direction.

Since the investigations of Birch Hirschfield in 1888, the bacterial origin of rheumatism has been suspected and studied. Sahli, von Leyden, Achalme, Triboulet, Coyon, and Apert isolated in rheumatism bacilli of the diplococcus type, which caused the death of guinea pigs from pericarditis, valvular lesions and the like, but in no case produced arthritis. At about the same time Wasserman isolated from a case of rheumatism, with complications, a diplococcus which when injected into animals developed after an incubation period of three to ten days a periarthritis without pus formation. Alkaline media were essential to the best growth of this diplococcus. Meyer followed by isolating a diplococcus from twenty-five cases of rheumatic tonsillitis, which he injected into the ear veins of rabbits, and then obtained from the joints a pure culture not differing essentially from that obtained by previous investigators. In one hundred rabbits inoculated, a polyarthritis developed, and in twenty-one endocarditis was produced.

Passing over the individual work of the other various inves-investigators, I come to that of Frissell. His first efforts to obtain from joints or nodes an organism having a causal relation to rheumatism being failures, he next made cultures from three cases of tonsillitis occurring during an attack of acute articular rheumatism. He obtained a streptococcus in nearly pure culture, but when this was injected into rabbits, the results were negative so far as arthritis was concerned. In March, 1904, he isolated from the throat of a patient suffering from acute articular rheumatism, with diffuse reddening of the tonsils and faucial pillars, but without exudate, an organism in mixed culture which after injection into the joints of a rabbit produced a polyarthritis. This organism, while culturally not readily distinguished from other diplo- or streptococci, yet had a special affinity for joints. This was shown by the fact that ten out of eleven rabbits injected had a polyarthritis, the other dying of pericarditis and pleurisy. It sometimes produced pus in the joints with disintegration of the joint itself, while no pus was

found elsewhere in the body. The course of the disease was towards spontaneous recovery. The pus formation he regards as probably due to the large amount of serum injected. He does not claim with certainty to have isolated a coccus which is specific in the sense that it will cause the disease known as acute articular rheumatism, but one that has an affinity for joints. Rheumatism may be due, not to a specific coccus, but to a coccus group intimately allied, though perhaps indistinguishable from each other by present cultural methods, the individual strains of which would vary greatly in virulence. He says, "Such a group might well contain the ordinary harmless streptococcus, a common habitant of the tonsil, so many of which were injected in our experiments into the animal circulation without producing symptoms. It might also include a variety causing an arthritis which tends to spontaneous cure unless the number of the invading host be too great, and range up to the malignant streptococci, causing septic joints, septic endocarditis and pyemia. Exposure to cold and wet, so long held as potent factors in the causation of rheumatism, may be considered as lowering body resistance, thus giving the bacterium a chance to attack the temporarily unprotected organism. The angina of tonsillitis often precedes and is frequently a symptom of acute rheumatism. What more natural supposition than that here the invading organism gains its access to the body, or is here overwhelmed by the resistance of the phagocytes, such an abortive attack constituting the ordinary tonsillitis. One is forced to look beyond the common joint affection to gain a clear idea of such a protean disease attacking, to be sure, oftenest the joints, but too frequently skin, pleura, and heart. Granted a point of entry, probably the tonsil, as the frequency of tonsillitis would suggest, the various conditions vaguely called rheumatic, as well as the out and out attack of acute articular rheumatism, seem best explained by considering the essential condition to be a blood infection[14]."

Rosenheim reports the careful study of eight cases in which there was an apparent relation between tonsillitis and rheumatism. In four, streptococci were found in pure culture; in two, streptococci and staphylococci; and in two, streptococci and other organisms were found in the tonsils. Two cases had serious endocarditis, in both of which the strepto-

coccus was found in pure culure. All were improved after removal of the tonsil, from which he concludes that bacteria penetrate deeply into the substance of the tonsil, and the organisms found in the tonsil are probably the causal agents of the attack of acute rheumatism[15].

The replies to my question have in the main clinically substantiated the foregoing relation between the tonsil and rheumatism, more than two-thirds of the reporters believing in such relation. Eighty-three replied in the affirmative as to rheumatism in general; two qualified by applying it to muscular rheumatism only; six thought it occurred, but only occasionally; three thought so, but had no proof; four had observed endocarditis and one pericarditis after tonsillitis. Thirty-five were doubtful as to any relation or did not believe there was any.

As to the question of whether the tonsil showed any particular lesion which would be suggestive of its being the cause of the rheumatism, the answers were as follows:

The characteristic rheumatic tonsil may be hypertrophied, fibroid, and have crypts filled with detritus. It may have stringy, white fibrous deposits and a peculiar soft, velvety red color. There may be moderate swelling with edema in the adjacent region. In other cases the tonsil may not be at all characteristic in appearance. Pain is an early manifestation. While usually enlarged the tonsil is not always so, but is congested, tense, and tender. Ingals, who has studied the matter considerably, says there is nothing in the appearance of the tonsil to indicate any relation between the two, but an analysis of cases seems to prove the relation[16].

Phillips had a case in which severe rheumatism followed an attack of acute tonsillitis in a subject who had never previously had rheumatism.

A. R. Elliott cites one case of rheumatism showing very marked improvement after tonsillectomy, and two other cases in which marked improvement of septic conditions, one of them being rheumatic, occurred after local treatment of the tonsil. He thinks it is not unreasonable to assume that the tonsils may originate the toxins causing chorea[17].

Levy thinks the opinion in regard to the apparent relation between the tonsil and rheumatism arises from the ease with which the infection causing rheumatism can or does enter

through the tonsil. One causes the other. The specific infection which produces rheumatism is the same that may produce tonsillitis. This is a reasonable and probably correct opinion.

Ross has seen many cases where the inflammatory rheumatism asserted itself concurrently or almost immediately after the subsidence of the throat condition.

Lee Cohen, of Baltimore, reports a case in a male of forty, who had suffered for a number of years with chronic subacute articular rheumatism, for which he was treated six weeks medicinally with no results. Then as an experiment he had the tonsils removed. The tonsils were found to be more like membranes than glands. Medicinal treatment was stopped, and the patient left the hospital fourteen days after the operation without the assistance of crutch or cane, and since then has had no return of the rheumatism.

Welty reports twelve cases of rheumatism cured by the removal of the tonsil. Diagnosis was based on the fact of the association of rheumatism and tonsillar disease in adults. The tonsils were all partially or almost completely submerged and had concretions in the crypts.

C. M. Robertson is certain that the tonsil is the offending factor in as high a percentage of cases as thirty in acute and ninety in chronic rheumatism.

In regard to the important question as to whether the rheumatism disappears after the removal of the tonsil, the replies indicate that while this does not always occur, the attacks are milder and occur less often where they do not altogether disappear. Twenty-nine reported "no" or "not always"; twelve said, "in some cases," while thirty-seven reported cessation or diminution in severity of the rheumatic attacks after the removal of the tonsil. One reported that the rheumatism was worse after the partial removal of the tonsil; another that the pharyngeal wall can perform some of the functions of the tonsil after removal, which observation accords with the history of one of my own cases. The patient was a woman of 45 years, who had suffered from severe rheumatic attacks for many years, located largely in the throat, and with considerable pain running to the ear, always coincident with tonsillar trouble. The tonsils were of the submerged type, small, but showing the results of frequent inflammation. They were removed by thorough enucleation

and for an entire year there was no sign of rheumatic trouble in the throat or elsewhere. Then she had an attack somewhat suggestive of the old tonsillar rheumatism, but much less severe. Examination of the throat showed no sign of tonsil, but some granular tissue which had filled in the space formerly occupied by the tonsils. This may be a case in which the infection entered through the granular tissue.

Griffin thinks that quinsy is a rheumatic disease and the rheumatic tonsil very common, but has not found that the rheumatism disappears after removal. As he does not perform a thorough enucleation, but only tonsillotomy, this may account for the lack of good results after removal. It seems to me that good results or the lack of them will depend on the type of the operation done, as it is not logical to expect the best results unless entire removal of the gland has been effected.

Isaac Taylor says that acute articular rheumatism is due to some species of streptococcus; muscular rheumatism to some bacterial infection, perhaps of a highly attenuated streptococcus. In many cases of tonsillar origin the muscles of the neck and shoulder are especially affected[18].

I have had several cases where removal of the tonsils has been done solely for rheumatism and with good results. Sufficient time has not elapsed to enable me to say whether or not permanent relief from the rheumatic attack has been attained, but I think it has. I have recently removed some tonsils with diseased crypts in a woman of forty-two, who had rheumatism of the neck and shoulders for many years. This ceased after thorough enucleation of the tonsils, and has not recurred.

Aneurism, appendicitis, erysipelas, meningitis, iritis, pleuritis, pericarditis, endocarditis, pneumonia, paraplegia, strabismus, nephritis, osteomyelitis, phlegmon, oophoritis, orchitis and general septic infection are all found in the literature as of tonsillar origin or occurring with or as a result of tonsillar inflammation. Investigation of all these would lead me beyond my present field. They all show the possibility and probability of the tonsil as a portal of infection, and prove that whatever of protective value to the organism the tonsil may theoretically have, practically it is of little value; on the contrary, it is not infrequently a decided menace to the organism.

ON THE USE OF CHEMICAL CAUSTICS.

Of 126 replies, 65 did not use any form of chemical caustic in the treatment of tonsillar troubles. By chemical caustics, I mean those commonly used to reduce inflammatory growths, to lessen the size of the tonsil or to destroy diseased crypts, and, in general, any chemical which applied directly is used to get the tonsil into a more healthy condition, leaving out of consideration the treatment of acute tonsillar inflammation. The chemical caustics which seem to be principally used are: nitrate of silver in varying strengths and the fused salt on the probe, trichloracetic acid, chromic acid, carbolic acid with glycerin and silver nitrate, London and Vienna paste, sublimate in alcohol, lactic acid and zinc chlorid. Forty-two out of 125, or about 33 1-3%, still employ these to a greater or less extent, while 18 have abondoned their use.

Many formulae for the use of these measures have been given me, with various combinations of these materials, the essential thing being to carry the substance as deeply into the crypts as possible, with the result of destroying or making the crypts smaller and bringing about a healthier state of the crypt wall, thus lessening the amount of secretion which exudes therefrom, shrinking the tonsil and getting it into a healthy condition.

While the advocates in favor of these measures are decidedly in the minority, I cannot agree with Dr. Freer, who regards chemical caustics as the resort of the timid manipulator who shuns surgery because he is afraid to do it, as many of the users of chemical caustics are good surgeons and cannot be said to use these because of fear of more radical measures. Certainly this is not true of Leland, Professor Chiari, Beck, D. C. Greene, Jr., Thomas Hubbard, Anderson, Roy, Clarke, Gleason and others.

There occur in the practice of most laryngologists a certain number of cases of diseased or hypertrophied tonsils in which for one reason or another radical surgery seems contraindicated, or, if indicated from the standpoint of the operator, is not accepted by the patient. In these cases I am satisfied from a considerable personal experience that fused nitrate of silver on the probe, chromic acid or trichloracetic acid carried deeply into the crypts reduces the size of the

tonsil very materially, and adds to the comfort of the patient, and will often be accepted when more radical measures will be refused. Other substances, no doubt, act equally as well. That these measures take the place of complete removal of the tonsil when this is indicated is not claimed, but that they have a place far more important than would seem to be indicated by the opinions I am quoting is, I am sure, the case.

Beck has recently been using the new bismuth paste—bismuth subnitrate 30, vaselin 70—injected while in a warm liquid state, by means of a glass syringe, into the crypts in cases of chronic lacunar tonsillitis, and reports good results from its use. As to the ultimate value of this, it is too soon to state.

Goodale has used a five to ten per cent nitrate of silver injected interstitially in hemophilia.

In mycosis, chromic acid and trichloracetic acid are used by several operators after removing the leptothrix masses. The chemical caustics are also used after slitting up the crypts.

Lermoyez, on the other hand, regards all chemical caustics as useless and bad for the voice. I cannot see how, properly used, they injure the voice at all or are likely to do so.

Beatle's fluid (iodin gr. 160, phenol gr. 320, glycerin 6 oz.) is used by E. B. Gleason in the diseased crypts of chronic inflammation.

C. M. Harris uses iodin glycerin, tincture of iodin and silver nitrate applied directly to the crypts, especially in early acute troubles.

INDICATIONS FOR THE REMOVAL OF THE TONSIL.

For many generations surgeons have recommended the removal of large hypertrophied tonsils; that is, those tonsils which appear to be obstructive in the throat, the so-called hypertrophied or large tonsil. It was formerly taught that only those tonsils which project beyond the anterior pillars are hypertrophied and to be removed. The common type of guillotine or tonsillotome was invented and adapted for this purpose, the forks being afterwards added so as to pull the tonsil out a little beyond the pillar, in order to make sure that a sufficient amount would be removed. From some 125 answers to the question as to the indications for the removal of the tonsil, I received the following:

Recurrent tonsillar abscess, or quinsy.—This would seem to be a sufficient indication, since in these cases there is a pocket at the superior and outer portion of the tonsil, which fills rapidly, and the history is that the patients who have had one attack are quite likely to have another. Thorough enucleation, and not tonsillotomy, is the only operation that will fulfill the indications and prevent subsequent attacks of quinsy.

Recurrent simple tonsillitis.

Benign tumors and new growths of any kind when their removal is not prejudicial to life.

Diseased crypts, with or without hypertrophy.—The tonsil in these cases is sometimes submerged or imbedded and sometimes not. Among the diseased crypt cases are also included those of mycosis. Many of the tonsils with diseased crypts are small and are visible only on retracting the anterior pillar. On grasping the tonsil with a hook it is found to lie rather deeply to the outer side and usually to be much larger than would be supposed from a superficial examination of the throat.

The coexistence of rheumatism and tonsillitis.—This has occurred so often that many operators regard recurring attacks of rheumatism associated with diseased tonsils as a distinct indication for their removal. Along with the studies in regard to rheumatism has come the growing conviction, based on a study of the lymphatic drainage of the tonsil, that enlarged cervical glands owe their origin in a large majority of cases to hypertrophied or diseased tonsils. Certain it is, that after the removal of such tonsils we have improvement.

Middle ear involvement, such as deafness and tinnitus, especially the progressive type, seems to be influenced unfavorably and even to be caused by enlarged tonsils as well as adenoids, and when so caused, the tonsils should be removed.

Mouth breathing, accompanied by hypertrophied tonsils, is sufficient cause for their removal, if for no other reason than to improve the facial aspect and the breathing.

General toxemia, impaired nutrition and systemic dyspnea, are perhaps more often evident with the tonsil as a cause than is recognized. A recent case of my own illustrates this: A policeman, who was in the habit of going to sleep and snoring

whenever he sat down, very large and continually putting on flesh, was referred to me for examination of the throat. The faucial tonsils were so large that they met in the middle line. On their enucleation the symptoms of dyspnea and general carbonic acid intoxication, as evidenced by the tendency to sleep, entirely disappeared, and the individual's entire character changed.

Remote reflexes, such as vomiting, cough, chorea, irritable and granular pharynx and enlarged glands, when the tonsils are the probable cause, should have for treatment the removal of the tonsils.

With reference to tuberculosis, there seems to be a difference of opinion. If tuberculosis is evident or suspected, it may do to remove the tonsil when the case is seen very early; but so competent an observer as Freudenthal advises against the removal of the tonsil in advanced cases of tuberculosis, since he has found it not only of no advantage to the individual, but a distinct disadvantage. Chambers cites a case of tuberculosis where the tonsils were thoroughly removed, following which there was increasing pain and rapid involvement of the entire operated area.

With reference to children, if one accepts the dictum of Bosworth that the tonsil is not a normal gland at all, hypertrophied tonsils in children should always be removed, even though there are no symptoms. It is probably the custom of many operators at the present time when operating for adenoids to remove the tonsils at the same time, even though there are no particular symptoms which lead one to do this, since we are uncertain as to their function and we know that they often cause trouble. Since apparently no one ever misses them when they are out, it seems better to give the child the benefit of the doubt and when the adenoid operation is done to remove the tonsils at the same time. This is my own practice if there is any suspicion of hypertrophied or diseased tonsils.

As opposed to this view, G. H. Wright has recently shown that there are four periods of molar tooth eruptions, with some variations in time, when the tonsils may enlarge without infection; viz., at two, six, twelve and seventeen years of age. Even if slightly enlarged, if not infected, the tonsils return to a normal condition with complete eruption of the

teeth. Diseased teeth are prolific sources of enlargement of the glands, directly by infection or by toxins. He advises that operations on the tonsils be deferred during these periods until the molars erupt. In a series of cases he found that the tonsil, while showing inflammation and enlargement during the period of eruption, returned to normal as soon as the tooth came through the gum. He regards the tonsil as having some value as a protector of the organism from the products of dental infection. Tonsillar enlargement without infection is a normal expression of the active function of the tonsillar gland, and when the tonsil becomes infected, it does so because of its lack of power of resistance to the invasion of micro-organisms[19].

In general, some of the statements seem to me too sweeping and others too conservative. For instance, Gildea and some others would remove every tonsil that shows any tendency to disease, whereas I think that many diseased tonsils are curable by local measures without removal. On the other hand, Gleitsman would remove only those tonsils that protrude beyond the palatine pillars. As many of the most troublesome tonsils, so far as the general economy is concerned, are those which do not protrude at all, this is necessarily too conservative.

Welty, of San Francisco, regards all tonsils in persons over twenty years of age as diseased, and says that the tonsil, when once diseased, predisposes the individual to any kind of infection, more especially the whole group of infectious diseases.

Professor Chiari, of Vienna, would limit the removal of the tonsils to individuals under forty, in the absence of further inflammatory symptoms and when there is no suggestion of hemophilia.

Several writers in speaking of the indications for the removal of the tonsils use the phrase "adherent pillars," "bad adhesions to the pillars," and the like. These terms seem to be misnomers, and I am quite of the opinion of Dr. Robert C. Myles, who has been claiming for years, in various papers written by him on the tonsils, that there is no such thing as adhesions to the pillars in the sense in which that term is ordinarily used. All tonsils are adherent to the pillars, anatomically so, the tonsil being a gland covered with mucous membrane on its free surface with a capsule on its external

side, set in between the anterior and posterior pillars and necessarily attached to them on the anterior, posterior and superior aspects, and to the mucous membrane adjoining the side of the root of the tongue on its inferior aspect. That the anterior pillar frequently forms folds known as the plica supratonsillaris and the plica infratonsillaris is well known, and this is what may be meant by the adhesions of some writers. As a matter of fact, these plicas are merely reduplications or folds of the free surface of the anterior pillar. In cases in which this does not exist, the mucous membrane of the edge of the pillar divides into two parts, one becoming continuous with the capsule of the tonsil and the other continuous with the mucous membrane covering the tonsil, the two together forming the attachment of the pillar to the tonsil which is invariably present. This line of attachment is the first thing to be severed in complete removal, in whatever manner it may be done. This gives access to the edge of the capsule, which is adjacent to the superior constrictor muscles of the pharynx, some of the fibers of which frequently penetrate it. I cannot see, anatomically, any reason for speaking of "adherent tonsils," or "bad adhesions to the pillar," except as one refers to the complete operation of tonsillectomy, in which, owing to the character of the areolar tissue, it may be more difficult sometimes than others to perform complete dissection. Also, the two folds going from the anterior pillars are sometimes thicker than at others, but they are true anatomic structures and always present.

The size and position of the tonsil with reference to the pillars, sometimes projecting, again submerged, varies greatly according as it projects into the cavity of the throat or is partially or completely submerged.

Finally tonsillar tissue should be removed when its pathological condition cannot be cured with treatment, when it obstructs the nares or oral cavities or interferes with their physiologic functions. This has no reference to the size, as a small diseased tonsil often causes more trouble than a large mass.

TONSILLOTOMY OR TONSILLECTOMY.

Twenty-eight favored tonsillotomy; 57, tonsillectomy; 32 do tonsillotomy in young children for simple hypertrophy, tonsillectomy in older children or at any age where there are dis-

tinct pathologic changes; two do tonsillotomy in adults and tonsillectomy in children.

The opinions given in answer to the question as to the preference for tonsillotomy or tonsillectomy show a gradual perceptible change towards the more thorough operation; since only 28 out of the entire number still range themselves as absolutely on the side of tonsillotomy, although the answers in the way of technic would seem to show that some of the operators who use the term tonsillectomy are content with rather less than the absolute removal of the entire tonsil gland. The tendency, however, is in that direction, and it is probably only a matter of a few years when the others—the 32 who use tonsillotomy for young children or in cases of simple hypertrophy and tonsillectomy in older children or when the tonsil is manifestly diseased—will use tonsillectomy in all their cases, since it is certainly not rational to remove a gland at all unless one removes it as thoroughly as possible, with a view to the prevention of any future possible complication.

To take some answers a little more in detail, Gleason, of Philadelphia, advocates tonsillotomy in simple hypertrophy, because it requires no general anesthesia and there is no risk. In recurrent tonsillitis and quinsy, with retention of cheesy matter, he uses more or less complete tonsillectomy, but with reluctance and a feeling that the remedy may be worse than the disease; he says it is theoretically comparable to the rough surgery of the Civil War. To which I would reply that a clean tonsillectomy is not rough surgery, but quite the proper operation for the purpose for which it is done.

Dr. Farlow uses tonsillotomy generally, because it has less risk, and thinks tonsillectomy has a risk out of proportion to its advantages.

Dr. Frank Miller says that tonsillotomy correctly done never causes hemorrhage, but there is bleeding if all the tonsil comes out, leaving the capsule, while tonsillectomy is very often dangerous, with sudden hemorrhage five to eight hours after when not expected.

Ross, of Montreal, finds tonsillotomy always satisfactory.

Professor Chiari uses tonsillotomy only, as the remaining portion of the gland atrophies, and in tonsillectomy there is danger of injury to the tonsillar artery in the capsule. Per-

sonal observation in Professor Chiari's clinic corroborates this statement as to practice, for I have never seen any operation done there except tonsillotomy.

Professor Gerber, of Koenigsberg, believes tonsillotomy sufficient, and thinks tonsillectomy more likely to cause hemorrhage than tonsillotomy, an opinion which seems to be of slight value, since he does not do tonsillectomy.

Pooley says tonsillotomy is the safest and the easiest, reasons which hardly carry much weight.

Luc does tonsillotomy with the cold snare

Sir Felix Semon has found tonsillotomy sufficient with very few exceptions.

As showing that the leaven of completeness in tonsillar surgery has not leavened the whole lump, so experienced an observer as Dr. Gleitsmann says he uses tonsillotomy and does not see any reason why the whole organ must be removed.

Dr. G. Hudson Makuen advises tonsillectomy, since the remnants of the tonsil after tonsillotomy do not easily drain their crypts into the pharynx, and secretions are more readily absorbed into the system.

Randall and Gradle do tonsillectomy by choice, but have had good results from less complete operations. This last remark, that is in accordance with everybody's experience, as it is an undoubted fact that many of the cases of tonsillotomy done by all of us have apparently served the purpose for which they were intended. As, however, a number of them have not, and as the trend of all working medicine should be towards improvement, and we have learned that tonsillectomy is apparently always a success, why should we in the future do any operation but the best one?

Kyle thinks the essential thing in all operations is to thoroughly free the upper and lower parts of the tonsil, and that in many instances, if this were carefully and thoroughly done, it would make very little difference whether the tonsil were removed or not.

Ellis has found that secondary hemorrhage is much less likely to take place if the tonsillar tissue has been completely removed, and for ragged, submerged and irritable tonsils he always uses tonsillectomy, particularly in adults.

T. R. French thinks that other things being equal it is desirable to leave the base of the tonsil in infancy.

Ballenger performs tonsillectomy, removing the tonsil with the capsule intact. The crypts of the tonsil extend to the capsule, and it is the crypts that usually form the atrium of infection. If the capsule is not removed, the surgeon is not sure that all the diseased tissue is removed. If tonsillotomy is practiced, a careless and imperfect operation is too often passed as a sufficient operation. A partial operation is frequently followed by recurrent tonsillitis and by the regrowth of the tonsil tissue. He has never seen recurrence after removing the tonsils with the capsule intact.

Bryant thinks both operations indicated in special cases. He uses tonsillotomy when the symptoms are only local; tonsillectomy when extended, such as cases of enlarged lymphatic glands.

A large number of others have abandoned tonsillotomy for tonsillectomy, since they have found recurring trouble after tonsillotomy.

Ward reports 800 cases of tonsillectomy, of which 129 had been previously operated on by tonsillotomy, having been brought back for reoperation on account of the remains of septic tonsillar tissue. It is not the size of the tonsil but its septic condition which is of importance[20].

Contrary to the oft expressed opinion as regards the difference in procedure between children and adults, Theisen, of Albany, always does tonsillectomy in childhood, since incomplete removal is frequently followed by recurrence of lymphatic tissue. In adults he finds tonsillotomy is often sufficient.

If one is to differentiate at all between the two, I should regard this opinion as more nearly correct than that of tonsillotomy in children and tonsillectomy in adults.

REOPERATIONS: AFTER ONE'S SELF OR AFTER OTHERS.

One hundred and six reported in the affirmative as to both; that is, they had operated on the same individual more than once and also after a previous operation performed by someone else. Ten replied in the negative, and five said they had reoperated after others, but not after themselves. This statement is easily explainable, as it not infrequently happens that a second operation is done by another operator. Nearly every operator who now does tonsillectomy reported that all of those secondary operations had been done after

tonsillotomies and that no occasion had been found to reoperate after tonsillectomies. That the tonsillar tissue seems in a measure to reform when the basal portion is left, is evidenced by the testimony of several good observers, such as Emil Mayer, Gleitsmann, and others. Packard states that he has operated at least a dozen times on cases that had been previously operated on by men who operate thoroughly. He has come to the conclusion that the tonsils may recur even when apparently a thorough operation has been performed. He truly states that as of course most cases go to another operator for a second operation, the statistics are necessarily misleading.

Joachim, of New Orleans, has not noticed the necessity of re-operation since tonsillectomy has been performed. Percy Fridenberg has never seen regeneration. He has reoperated, however, when for some reason or other removal of the tonsils was not complete.

As to the question of regeneration, Berens, who has reoperated in several instances, cites one case where a very large tonsil was removed from each side. Observation of the throat nine months later showed a very large tonsil had returned on one side, the removal of which was not followed by its regrowth. Here it was possible that the tonsil was not removed in toto in the first instance, and that either the action of the muscles of the neck forced the tonsil into prominence, or else there was a certain amount of true regeneration.

Hajek says that he has reoperated, and that in the case of small children, after amputation of the tonsil, the remainder of the tonsil can again become hypertrophic. Lermoyez says there is no need for the return of the tonsil if it is properly removed in the first instance. Gradle thinks the remnants can enlarge. Professor S. S. Bishop says he has always removed the whole tonsil; hence there was never any need to operate subsequently. As, however, in the description of his technic in detail he merely does an amputation, as completely as possible, with the Mackenzie tonsillotome, the statement as to his having always removed the whole tonsil may admit of honest doubt. Professor Luc says that since doing complete removal he has never had occasion to reoperate. Logan Turner thinks that in some cases there is distinct regrowth.

The practical unanimity of opinion as to occasional need for reoperation after tonsillotomy, not to quote individuals further, would seem to show that tonsillotomy is certainly an incomplete operation and that it does not fulfill, as so many of its advocates aver, all the indications.

ANESTHESIA.

There is quite a difference in usage in regard to the question of anesthesia. In operations on children several operators use no anesthesia whatever, and it is well known that it is not the custom on the continent of Europe to anesthetize children for adenoid and tonsil operations. In America, most parents prefer that the child shall be spared the shock and pain of the operation, even though it be not so very great. Anesthesia also has the advantage that it allows time enough to do a better operation, especially in the dissection of the tonsil, and with few exceptions all of the persons reporting to me are in the habit of using anesthesia in operations on children. For local anesthesia, cocain in some form or other is mostly in vogue, either by injection or painted on in varying strengths. The reports on this question were as follows:

Sixty-three use ether as the anesthetic for children; 10, gas and ether; 10, chloroform; 1 uses chloroform up to twelve years of age, ether after this age; 7, ethylchlorid; 5, somnoform; 2, nitrous oxid; 3, ethyl bromid; 2, ethyl chlorid and chloroform.

Packard thinks mixed anesthesia is no more dangerous than any any other. Care should be taken that no food is taken beforehand; twice he has nearly lost a patient on account of food having been taken beforehand. He has not found the use of atropin satisfactory. Pierce, on the other hand, advises its use to lessen the amount of mucus during the operation.

Yankauer has obtained satisfactory local anesthesia by injecting with a long needle 15 minims of a 1% solution of cocain into the sheath of the middle and posterior palatin nerves as they leave the bony opening in the posterior part of the hard palate at the junction of the alveolar process with the horizontal part of the bone.

Ether seems to be the anesthetic of choice. I invariably use it, and have had no serious accident from its use. On one

occasion during etherization and before the operation was commenced, a child with very huge tonsils became asphyxiated, stopped breathing, and artificial respiration was required for a few moments. The result was all right and the operation was performed as usual, although for a few moments things looked rather bad. I was on another occasion badly scared with chloroform. The child blanched out, the pulse stopped, and the outlook seemed dubious. Recovery, however, took place, and the operation was performed. The difference between ether and chloroform is, that ether gives a warning usually sufficient to enable one to remedy the condition, while chloroform acts so quickly that it may be too late. Of 29 fatal cases reported, 26 were due to chloroform. Chloroform does not seem to be indicated in the lymphatic diathesis. I have had no personal experience with the other anesthetics, but assume they have been satisfactory to the persons using them. Ether would seem, according to all the testimony, both as here given and as found in literature, to be the safest of the anesthetics, although, of course, not without a certain danger itself.

As to the method of giving ether, the drop method, the cone, and some form of bulb and pipe apparatus, are all used. Up to the present I have relied on the closed cone. For deep narcosis, in an operation which may be at all prolonged, the bulb and pipe apparatus is doubtless preferable.

Operation under general anesthesia should be done in the nospital or home, and not in the physician's office.

POSITION.

In operating upon children under anesthesia, the dorsal position is preferred by 25, the prone on one side or the other by 40, the semi-recumbent by 2, the Rose or Trendelenberg by 7, and the upright by 27, the various recumbent positions being still further modified in accordance with individual preference. It is somewhat remarkable that the upright position is used almost exclusively by operators in the New England States and by several scattered over the West and South, who were former house pupils in Boston hospitals.

Phillips believes the upright position to be unnecessary from the standpoint of skill, and to be fraught with danger of syncope, suffocation, flooding of the larynx, and pneu-

monia. Packard thinks this position adds greatly to the danger of ether and chloroform and to the risk of detached tissue entering the larynx and causing dangerous obstruction.

On comparing the reports of accidents, hemorrhages and the like, I do not find that they have been any more common in those who operate in the upright position than in those who operate in the dorsal or recumbent. The operating room nurse in our own hospital has told me that all the unpleasant experiences coming under her observation in the past four years were in cases operated upon in the prone position. Without exception, everyone who operates on adults under local anesthesia does so in the upright position, and as all those who use no anesthetic whatever operate in the upright position, it would seem, from anatomic reasons of position and comfort of vision, that the upright position was preferable to the recumbent or dorsal, unless there are manifest reasons why one is much safer than the other. I almost invariably operate in the upright position, in most cases in adults, as well as in children. I usually give general anesthesia, and, when completely anesthetized, the patient is put in a chair facing the light, or else I use a head mirror and artificial light. The patient is not so profoundly anesthetized as to abolish the reflexes, and I have not had, so far as I know, any accident due to position. It is true that at a demonstration at a meeting of this society I had an unfortunate experience in an operation done in the upright position, tracheotomy having been required. That, however, as I stated at the time, was due entirely to a fault in the matter of technic in the introduction of the gauze pressure sponge too heavily soaked in peroxid of hydrogen, and was not at all dependent on the position which was used. The same thing was just as likely to have occurred in the three following cases, done at the same time in the same position and without accident. As never before nor in the year that has elapsed have I had any trouble incident to the question of position, I defend the upright position as perfectly proper, and to be used by those operators who prefer it, without in the least condemning the prone or horizontal position, since, so far as thoroughness is concerned, it is possible to do the operation as well in one position as in the other. In the case of severe hemorrhage, where there is danger of swallowing considerable blood, and where a large pad of pres-

sure material may have to be introduced, the Trendelenberg or Rose position is probably more advantageous as interfering less with respiration. I occasionally operate on adults in some of the recumbent positions. Even then I prefer the head and shoulders somewhat elevated. The advantage of the upright position is that the anatomic relations are normal and one has a good view of the entire area. In my operations the amount of blood vomited afterwards is comparatively slight, and I have found no discomfort in any way from it.

INSTRUMENTS.

The armamentarium is a matter depending entirely upon the type of operation to be done. For simple tonsillotomy, a mouth gag, tongue depressor, tonsillotome, and perhaps a pair of grasping forceps, seem to be all that is necessary; whereas when one sets out to do a complete enucleation his armamentarium depends entirely upon the particular type of operation he intends to do and the instruments which he individually prefers to attain that end.

For tonsillectomy all of the following instruments have been mentioned; mouth gag, tongue depressor; grasping forceps of the following varieties—rat-toothed, Ballenger's, Richards', type special to reporter, tenaculum, and vulsellum; separators —blunt, right-angled and saw-edged, Yankauer's, Sajous', Leland's, Ingall's, Freer's and Freeman's knives, spud and finger nail; cutting instruments—scissors curved on the flat, Robertson's scissors, Farlow's and Peter's snares, various types of Mathieu's and Mackenzie's tonsillotomes, Casselberry's knife, galvanocautery, curved and straight knives, and ecraseur; punches—Myles', Farlow's, and Rhodes'.

TECHNIC.

The technic of tonsillotomy seems to be unchanged over the years, with the exception that the punch is used by many in the attempt to remove what may be left after the tonsillotomy, the tonsil forceps are employed to get more of the tonsil into the ring, and pressure on the outside of the throat is made by many. The technic, as given by the operator citing the largest number of tonsillotomies, is extremely simple, his technic for children and adults being given as

follows: "Patient seated in a chair—cocain—Mathieu's tonsillotome—cut."

As to the results in tonsillotomy, it cannot be denied that a good tonsillotome, followed by the punch forceps, removes the greater portion of the offending gland. I have examined a good many of my earlier cases of tonsillotomy, some after the lapse of many years, and have found, in the main, that the results have been satisfactory. In several of them, however, there has been quite too much of the gland remaining for me to consider that the operation had done all that it might have done for the individual had the tonsils been completely enucleated, and there have been a few peritonsillar abscesses.

The replies to the question as to the technic of tonsillectomy show that each operator starts out to remove the entire gland, but evidently with varying conceptions as to how this is best accomplished. There is a difference of opinion as to the capsule, some saying that they leave the capsule, or punch out everything to the capsule. Thorough enucleation of the gland requires the removal of the tonsil with its capsule, and this is evidenced by the reports of the technic of all those who really do a thorough enucleation. To enucleate requires, first, the separation of the attachments (to my mind the miscalled adhesion) of the outer and inner surface of the tonsil to the mucous membrane and edge of the anterior pillar, which edge at this point divides into two layers, one continuous with the capsule, and the other continuous with the mucous membrane of the tonsil surface, the free mucous portion of this, with probably a few muscle fibers, sometimes folding over the front of the tonsil and sometimes above and below, forming the so-called plica. The tonsil is attached to the posterior pillar as well, and to the superior border where the two pillars meet. When this separation is made, the tonsil is detached with its entire capsule from its attachment by fibrous fascia to the inner border of the superior constrictor muscle, some of the fibers of which seem to run into the capsule at times, so that occasionally this detachment is impossible without the removal of an occasional muscle fiber. In other cases the capsule can be separated without apparently removing a single muscle fiber. To accomplish this requires some form of dissecting instrument, sharp or blunt. These are various, consisting of the knives, scissors and blunt spuds already mentioned, which

are used while traction is being made on the tonsil, in this way everting it from its bed. Many operators, including myself, find that this separation is made very readily with the finger, which gives one control of the sense of touch, and with a sharp, clean finger nail it is in most instances easy to make the first line of cleavage with the nail, and then follow it up until the tonsil is pretty thoroughly shelled out, when any detaching instrument can be thrown over the portion that remains, which is the portion at the base of the tongue. Several types of grasping forceps, over which the detaching instrument can be placed, have been recently devised. Other operators, grasping the tonsil, take knife or scissors, cut along the edge of the pillar until the white edge of the capsule is reached, and then follow the dissection with knife, scissors or blunt instrument. Quite a variety of instrumental methods can be used to accomplish exactly the same result; namely, the shelling out of the tonsil from its bed and the cutting off of its attachment at its lower border near the base of the tongue. One can also do this entirely with the finger, as is proved by Dr. Charles W. Richardson and others. I was under the impression that I was one of the first to use the finger nail as a dissector of the tonsil, and I was certainly one of the first in American literature to describe a finger-nail dissection.[22] I am not, however, the earliest in the description of this, as the following quotation from Lambert Lack shows:

"In enucleation an incision is made through the mucous membrane between the anterior pillar of the fauces and the anterior border of the tonsil, through which the finger or blunt instrument is introduced and the tonsil shelled out of its bed. This little operation is not at all difficult to perform if care be taken to keep outside the tonsil capsule, this being but loosely attached to the surrounding areolar tissue. It takes a few minutes to complete, however, and a general anesthetic is advisable. Its advantages are:

(1) There is no risk of hemorrhage, the vessels being torn across outside the tonsil, where they are healthy.

(2) Complete removal, a point of importance in case of frequently recurring tonsillitis. When a tonsil is removed with a guillotine or snare, the tonsil crypts will be found open on the cut surface; that is, some of them have been left behind.

(3) In some cases of flat tonsils there is no other practicable method."

One of the advantages in using a finger nail is that in buried tonsils, where it is sometimes hard to get good traction with the forceps, without tearing, and where there may be danger of cutting the pillar with sharp instruments, it is possible by the sense of touch alone to do nearly the entire dissection. It is my own habit not to apply any form of traction forceps until after the dissection is partly made and the tonsil somewhat pedunculated. The forceps, whatever their type, are then less likely to tear through. In my first operations of this kind, I seized the tonsil with the grasping forceps, having the tonsillotome swinging on the blades. Later I devised one of the many types of ringless forceps, with the idea that after once getting a good hold it would be possible to throw the detaching instrument over the forceps and the tonsil. As to the type of cutting instrument, these vary with individual usage. Personally, I prefer a ring tonsillotome of the old Mathieu type, without the forks. (I think it is known in the instrument catalogues as Casselberry's.) Before getting these I had removed the forks from my old instruments, and they work equally well. I also use the snare, which is efficient and is preferred by some, but I do not feel certain that there is less hemorrhage after its use, as is often claimed. When well applied it follows the natural inequalities of the tonsil perfectly. Norval Pierce uses a separate snare for each tonsil, looping and tightening the first, applying the second, and then detaching them in the same order. He claims this method lessens hemorrhage. A thorough operation can be done with the Robertson scissors, and Robertson, who demonstrated his method at the meeting of the American Medical Association at New Orleans, is entitled to very much of the credit for the operation of thorough enucleation, being one of the first to describe that method. His operation consisted of detaching the tonsil from the pillars with a double-edged sickle knife, grasping the tonsil with the vulsellum, and going in behind it with specially constructed scissors. He made the statement, which has been borne out in some instances in my own experience, that if bleeding occurred afterwards, some portion of the tonsil had been left. I have found that sometimes, in the final cutting or in the necessary dissection, a piece of the tonsil

is left either above or below, and after detachment of the tonsil I invariably feel with my fingers between the pillars and above where they meet, to see if any portion of the tonsil can possibly be left; if so, it is again grasped with the forceps. Care should be taken not to have too much traction when the final detachment is made, on account of the danger of making too deep a wound at the base of the tonsil.

Yankauer divides the plica triangularis at its junction with the anterior pillar, after freeing the upper part of the tonsil, using an ordinary pair of surgical scissors curved on the flat. This is done because after dissection of the plica the tonsil becomes freely movable, so that if downward traction is made upon it the entire organ can be pulled down from its place of concealment in the velum of the soft palate, even when the velar lobe is quite large[23].

J. L. Goodale's method is to pull the tonsil toward the median line by forceps passed through the loop of the snare, make a semilunar incision with a sharp knife from just outside the base of the uvula toward the mucous membrane covering the anterior aspect of the tonsil, downward to the base. With the same knife the tonsil is freed from its attachment until the main fibrous trabeculum is reached, this being cut through slowly with snare. This operation affords minimum subsequent discomfort, the muscular parts being cut out with a sharp instrument.

Thomas Chew Worthington, of Baltimore, whose method was referred to by several, uses vulsellum forceps and knife; otherwise he employs the usual methods of enucleation[24].

West dissects the tonsils from the posterior pillar with a right-angled knife, makes a circular cut around the tonsil through the mucous membrane, using traction while cutting through the loose tissue connecting the capsule to the fascia of the superior constrictor muscle with a knife, thus completing the enucleation. He begins posteriorly, as he finds the hemorrhage is less this way[25].

F. E. Miller, who has done over eleven thousand tonsil and adenoid operations, says that the beveled knife and beveled fenestrum Mackenzie form ideal instruments. He operates under gas anesthesia, which he considers relaxes the muscular fibers more than any other anesthetic. One whiff often relaxes the pillars, and the tonsil falls almost out of the capsule, at

which moment it is cut. He says these instruments are equally effective for submerged tonsils.

It would seem, from the reports given, that adult tonsils are removed less thoroughly than in operations upon children, many contenting themselves with pinching out the adult tonsil, or with less thorough dissection. If, however, the adult tonsil is to be removed for rheumatism, it would seem necessary to do it as thoroughly. The whole trend of thought seems to be in favor of complete enucleation, with the capsule, and the accidents so far seem to be few.

The throat is sorer after tonsillectomy than after the old tonsillotomy, but the result justifies the discomfort. In the adult a week elapses before the soreness disappears.

HEMORRHAGE.

In reply to the question, "How often and in what class of cases have you had hemorrhage; how many within a few hours, delayed primary; how often secondary?" I received a variety of answers, showing great variation in individual experience. One hundred and seventy-nine cases of primary hemorrhage and 54 of secondary hemorrhage were reported. Individually, they vary from none at all, reported by several, to as high as 10%, bleeding sharply at the time. There is evidently great variation in what is understood by primary hemorrhage. Secondary hemorrhage has occurred all the way from one to seven days after operation, several of them being serious, and not all of them in hemophiliacs by any means. Two of my own had secondary hemorrhage, one, somewhat alarming, six days after, and another five days after. As to primary hemorrhage, we are wont to think that if this is at all serious we have to do with a hemophiliac, and that is sometimes the case; nevertheless, the possibility of bleeding in every tonsil operation should be considered. For this reason I have ceased to do the tonsil operation in my office. Nor do I consider it wise to operate when the tonsil is inflamed, and would prefer not to operate on females during the menses. On one occasion when I did a tonsillotomy in my office on an adult, under local anesthesia with cocain and adrenalin, there was no bleeding at the time of operation, but four hours after there was most alarming hemorrhage, controlled with difficulty. Since that time I have abandoned the

use of any adrenalin preparation in the removal of tonsils under local anesthesia, preferring to have my bleeding at the time of operation, rather than several hours later.

Comparing tonsillotomy with tonsillectomy, I have found, contrary to some observers, that there is less bleeding after tonsillectomy than after tonsillotomy. Nevertheless, I have seen one case of most severe bleeding in a child a few hours after tonsillectomy.

Griffin reports that he has done over thirty thousand cases of tonsillotomy and has had only one hemorrhage, and that one a bleeder.

E. M. Holmes, of Boston, has had twenty delayed primary and three secondary hemorrhages in twelve thousand operations.

Francis R. Packard has had to pass a ligature, by means of a curved needle, to stop the hemorrhage; and Sprague, of Providence, has had the same experience.

F. E. Miller observed many hemorrhages from various causes, several five days after the use of the galvanocautery snare.

Wilson now avoids hemorrhage by dissecting, for the most part, with the finger, after which he finds the bleeding is less.

One reporter gives two cases of severe bleeding in children, one fatal. The other required transfusion, after which recovery took place. He also had one adult who bled to faintness.

Stout has seen in adults many cases of profuse, though not dangerous, bleeding.

Ballenger says he does not find that hemorrhage depends to any extent upon the class of cases, but upon whether the muscles forming the sinus tonsillaris are injured. In all classes of cases hemorrhage may follow the decapitation of the tonsil, perhaps more often in the fibrous or sclerotic tonsils. Otherwise the hemorrhage depends largely upon the injury of the muscles of the anterior and posterior pillars and the superior constrictor of the pharynx. As the arteries are either buried in or are external to these muscles, they will not be injured if the muscles are not injured. The tonsillar artery, while external to the superior constrictor muscle of the pharynx, is one large stem. In passing through, it subdivides into three or four branches. If, therefore, this muscle

is injured, the main trunk may be divided and the hemorrhage be great, whereas, if the tonsil is removed without injury to this muscle, only the branches are divided and the hemorrhage is correspondingly less.

Barnhill has found primary hemorrhage frequent, 10% bleeding sharply at the time. He has had two cases that bled to the point of alarm several days after the operation, but no fatalities.

Kenefick has previously reported a case of death in a hemophiliac, and ever since then has been afraid of hemorrhage, although he has had none since.

Hajek has seen troublesome hemorrhage only after tonsillectomy, an opinion not in accord with that of most American operators who do tonsillectomy.

Levy says he should estimate roughly that delayed primary hemorrhage has occurred in about 10% of his cases, and that it often comes when the form and appearance of the tonsil least lead one to expect it.

Matthews, who has done many operations on children, has seen troublesome bleeding in the first twenty-four hours, once after complete enucleation with the finger; several after tonsillotomy.

Munger has had to use the tonsillar clamp.

Beck says that one in twenty bleed freely after the local anesthetic passes off. One of his cases oozed for a week.

Cohen found after a careful analysis of 111 cases that four tonsillotomies bled, two severely, and of the tonsillectomies three bled primarily and three secondarily; all but one easily controlled.

Getchell finds hemorrhage infrequent, but often enough to give him some anxiety in every case. He thinks a patient ought to remain in bed in the same building in which the operation is done for at least six hours.

Professor Chiari reports one case of bleeding after four hours, one after 24 hours, in two adults over forty, one of whom had to have compression applied for half a day, and in the other the pillar had to be sutured. He does not think tonsillotomy should be performed in adults with very large tonsils, on account of the danger of hemorrhage.

Thrasher, of Cincinnati, says that when the operation is done with the head far below the body, there is always free

hemorrhage immediately, and then probably no more. He has had secondary hemorrhage on the following day twice in 3,000 cases.

Luc reports two cases of severe hemorrhage, one to syncope.

Sir Felix Semon has had very serious hemorrhage three times, twice immediately after the operation, and once several hours later.

Welty has seen only one case of hemorrhage after 300 cases of tonsillectomy, and thinks that all hemorrhage after tonsil operations is dependent upon the amount of tonsillar tissue remaining. In the one case that bled there was some tonsillar tissue remaining, as he discovered later. After other methods he has had severe hemorrhages several times.

Todd has had no hemorrhage not controlled at the time of operation since ceasing to use sharp instruments.

Moure, of Bordeaux, reports a case of severe hemorrhage occurring twelve days after a galvanocautery operation.

Brainard, of Boston, has had two secondary hemorrhages in adults, neither fatal, but both alarming.

Pynchon gives his patients a most elaborate paper with minute directions as to what to do in case of hemorrhage, so that he must consider that bleeding occurs sufficiently often to render this necessary. There are four pages of closely printed directions and two pictures in this circular. He gives chlorid of calcium by the mouth or rectum in 10 grain doses in 2 ounces of water, repeated hourly for three doses. After the three days it is discontinued for a few hours before being used again. Forty to 60 grains in 24 hours is the maximum dose. He also mentions lactate of calcium in single doses of 30 grains.

Turning now to the recent literature, one finds a good many cases of hemorrhage, although Haymann thinks a great many more occur than are ever reported, since the tendency to relate unpleasant experiences is not great.

Damianos and Herman report 50 cases of severe bleeding after tonsillotomy, in only five of which there was any definite etiology suggesting hemophilia. There were eight deaths, only two of which occurred in hemophiliacs".

There is only one case in literature where the internal carotid was injured. This operation was done by a quack, and is related by Biclard and referred to by Bardeleben. There

is a second case which is said to have been an injury of the carotid, but careful reading would seem to show that this was not the case.

Heuking reports six cases of severe hemorrhage occurring in his practice, in all of which the operation was done with the tonsillotome, and the injury was at the junction of the anterior and posterior pillars, or else at the beginning of the posterior pillar. In none was the hemorrhage from the stump of the injured tonsil. They were all stopped by digital compression with a gauze sponge, and might have been stopped by compression forceps, as in all the cases the hemorrhage ceased without torsion. The ages varied from fifteen to sixty years. Death occurred in several of the cases. The free border of the posterior pillar was caught in the ring of the tonsillotome, thus leaving an open vessel without good opportunity for retraction, and not particularly visible. Owing to the action of the muscle, coagulation was hindered by coughing, vomiting, and gagging[27].

In 1904, Harmon Smith reported six fatal cases of tonsillar hemorrhage and 48 cases of severe hemorrhage, three of them being his own, in which the bleeding was controlled only by the tonsillar pad hemostat. The special causes of hemorrhage are given as hemorrhagic diathesis; fibroid tonsils; age (adults rather than children); sex (males rather than females); acute inflammation; anemia; malignancy; abnormalities in the distribution of the blood vessels, such as the ascending pharyngeal artery; abnormally large tonsillar artery; abnormal internal carotid; large vessels in the anterior pillar of the fauces; wounding of large venous plexus at the lower and outer border of the tonsil; arterial sclerosis. The exciting causes are traumatism and local anesthesia, combined with an astringent[28].

I find the following reports in recent literature, mostly since Smith's article, and not included in those reported by him:

Lamb has reported a case of very severe hemorrhage, requiring the suturing of the pillars[29].

Stewart removed the tonsils and adenoids under ether in a boy of seven; there was free hemorrhage, which soon stopped, but two hours later blood extravasation took place in the neck and subcutaneously. Death occurred 32 hours after the operation[30].

Murray has reported three alarming cases of hemorrhage, one six days after operation, requiring etherization and the sewing up of pillars. The second case bled for six hours after the operation and required the suturing of the wound[31].

Brown reports three cases of serious hemorrhage, the first primary, the second two days later, controlled with difficulty; the third 15 days later, persisting for several hours[32].

Roberts had one patient who nearly died from hemorrhage after using the tonsillotome. Operation was done in the upright position[33].

Jarecky reports two cases of secondary hemorrhage, due to injury of the plexus of veins at the tonsil base[34].

Bulson, ten hours after an operation on a boy of six, had hemorrhage so severe as to exsanguinate the child. Saline injection and hypodermics of strychnin and whisky were given. The temperature went to 106, and at one time the child was supposed to be dying. The hemorrhage seemed to cease of its own accord, but it left the child in such a collapsed state that life was maintained with difficulty a sufficient length of time to recover somewhat from the loss of blood[35].

Hayman reports one of his own cases, in which death occurred after operation on adenoids and tonsils. The child was fourteen years of age, operated on at 11 o'clock in the morning in the usual way. There was no unusual amount of bleeding, and what there was apparently stopped completely. Two hours after the operation slight, but continuous, bleeding came from the nasopharynx, soon followed by considerable vomiting of blood and hemorrhage from both tonsil stumps. Peroxid of hydrogen was used, as well as powders and tamponing. These stopped the bleeding from the adenoid region, but not from the tonsils. Cauterizing remedies were then used. The bleeding stopped, but a few hours later began again, so that the entire pharynx wall showed the presence of blood, the exact origin of which was difficult to find. Adrenalin was used hypodermically to no purpose. Gelatin was then injected subcutaneously. The bleeding became more profuse from the tonsils, the two pillars were sewed together over a gauze tampon, and the nasopharynx plugged absolutely tight. Later collapse came on, pulse 140. Digital compression against the stumps of the tonsils was next made and then the Mikulicz tonsil clamp was used. The bleeding stopped for about half

an hour, then began again. The tampon came away under the stitching, and the two tonsil pillars were again sewed up over a heavy gauze tampon, but all to no purpose, as the patient collapsed again. Respiration became bad, and two hours later death occurred. At the autopsy the organs were found completely normal. All the portions of the throat were taken out and carefully examined, but the autopsy was made so late that it was impossible to have any microscopic examination. The only history suggesting hemophilia was that the child bled rather easily after injury to the finger, but earlier in her youth she had been operated on for enlarged glands without any special bleeding having been noticed[26].

There is a tendency to call all such cases as the foregoing cases of hemophilia, even though other signs of hemophilia are absent. Leukemia can give us a dangerous bleeding. A wax-like pallor of the tonsil is characteristic of this condition. Zarniko and Berger have each reported a death after tonsil operations on leukemic cases. The sharpness or dullness of the instruments used does not make any material difference. Haymann reports twenty-one cases of severe bleeding in three thousand, which is less than one per cent. Of these, two thousand were operated on during the first ten years of life, and eight hundred in the next ten years of life.

Lack, of London, has seen most alarming hemorrhage after tonsillotomy, persisting for hours and ending only on faintness. He thinks severe hemorrhage will occur in three out of four cases in fibrous tonsils of adults if cutting instruments are used[27].

Without carrying these statistics further, we can see that with rare exceptions every operator doing any amount of work has had hemorrhage at some time or other. It seems to me that this is less likely to occur after the operation of tonsillectomy, but I do not deny that it may and does occur after this operation.

Chevalier Jackson says that oozing after tonsillectomy is exceedingly rare, and that it is bleeding from a vessel concealed back of the anterior pillar that is usually mistaken for oozing.

The hemorrhage seems most likely to come from the vessels around the base of the tonsil or from injury to the pillars, since when no portion of the tonsil is left, the vessels of

the muscular tissue of the superior constrictor usually contract to such an extent as to completely close the mouths of the vessels.

As to the best methods of handling hemorrhage, simple pressure with a good-sized cotton or gauze tampon carried into the tonsil cavity and maintained for a short time, will usually be sufficient. If it is not, the tampon may be soaked in a weak solution of nitrate of silver or in peroxid of hydrogen. In this case one must be careful that there is no free fluid or excess on the sponge. Should this be the case when peroxid of hydrogen is used, there may be too great formation of gas, with the danger of inhaling some of it into the trachea with resultant difficulty in breathing. If the simple pressure is insufficient, the bleeding point can be grasped with the tonsil hemostat and the vessel twisted or tied. Tying the vessel is very difficult and will seldom be necessary. Suturing the pillars over a pad of gauze is efficient and much easier than tying the tonsil. This suture is removed in twenty-four to forty-eight hours. For continuous oozing, lactate or chlorid of calcium may be used. Monsell's solution should be avoided as dirty, not very effective, and as having danger of secondary hemorrhage when the slough comes away. The large tonsil pad hemostat may be needed, but is very uncomfortable for the patient, and should be avoided if possible. There is also danger of slough from its use.

Dr. Chevalier Jackson, of Pittsburgh, has reported six cases of ligature of the external carotid for hemorrhage. Dr. Jackson's cases were seen by him as consultant after everything else had been tried and the patients were moribund. In one case caustics had previously been used, and when the slough began to separate there was oozing again, and had the carotid not been tied the patient would have bled to death. Dr. Jackson's experienec is somewhat unique. In most cases it is probably possible to stop the hemorrhage, even where the bleeding is severe, without resorting to so formidable an operation.

From the reported cases there is no particular proof that dangerous bleeding occurs more often in adults than in children. There seems to be sufficient testimony in favor of the use of calcium chlorid and calcium lactate as preventives of hemorrhage to warrant their future use. Pierce gives the

chlorid for a week before operation, while most operators advise its use for three days.

Bryant gives the calcium salts two or three days before operating, and has no annoying hemorrhage.

Lermoyez always gives his patients three grams a day of calcium chlorid for three days preceding the operation. He says there is hemorrhage when the pillar is injured and when the whole tonsil is removed at once in an adult.

OTHER ACCIDENTS.

Exclusive of hemorrhage, the following accidents were reported:

Sixteen have seen injury to the uvula, the pillars or the palate, even to the point of temporary paresis of the soft palate. I have seen one such case as a result of twisting the artery in the soft palate after troublesome hemorrhage. The condition lasted about a week, followed by perfect recovery. While the paralysis lasted the voice was much altered. Three others report alteration of speech from injury to the pillars.

Quinsy from incomplete operation, and as a result of injury with the snare, double otitis media with double mastoid, and acute otitis media were reported. Four observers had mild cellulitis follow, once claimed to be due to unclean instruments used by students. Severe surgical shock with deep sloughing in the tonsillar region was twice seen by Berens after the use of the snare. Simple infection is reported four times. Jackson reports a case of cervical cellulitis from operation; three cases of respiratory arrest, one of cardiac arrest, all requiring tracheotomy and with recovery in all cases. Torticollis was observed in one case; and one reporter nearly lost two cases from chloroform anesthesia.

The following deaths were reported:

E. M. Holmes, a case of general staphylococcus infection, death on the tenth day, with staphylococcus aureus in all the organs. He states there was no other known way of entrance, as everything was as aseptic as possible at the time of operation. As, however, a submucous operation on the septum was done at the same time as the tonsil and adenoid operation, it is hard to say to which operation, if any, death was due. The operation was done on the back. After the boy was returned to the ward he turned blue, the heart became rapid and weak, and death ensued.

Hubbard cites two deaths, one from pneumonia, chloroform anesthesia, erect position. The other was in the practice of a colleague, where a mixture of chloroform and ether was given, with a local injection of ten to fifteen minims. Death occurred with the symptoms of adrenalin poisoning in about one minute.

MacBride reports one death from chloroform and one from sepsis or malignant scarlet fever on the second day.

Cohen has knowledge of a death from spasm of the glottis during etherization, and now fears to operate unless he has facilities for intubation and tracheotomy at hand.

Thompson had a death from chloroform from respiratory failure after the operation was completed.

Gradle had a patient who was said to have died from an abscess in the throat one and a half weeks after a perfectly smooth tonsillotomy done with the tonsillotome, but does not know the details.

I have had one case where after removal of the tonsil a pledget of gauze wet with too much peroxid of hydrogen was placed in the tonsil cavity to stop the bleeding. There was so much gas formation that some of it was inhaled, interfering with respiration and requiring tracheotomy. Recovery took place. This is the same case referred to under the section on position.

EFFECTS ON THE VOICE.

The question of injury to the voice is one that merits discussion, inasmuch as the laity have considerable fear that the tonsil operation will injure the voice. By far the great majority of the reporters have seen only improvement and not injury to the voice. Those physicians having most to do with professional singers, however, give somewhat guarded replies, and admit that for the time at least there is an alteration in the voice, followed later, as a rule, by improvement, most of them having found that higher tones were obtainable than before, an exception being DeBolis, who finds the voice generally lowered.

E. L. Shurley has seen many cases where the tone or quality and the sustaining power of the voice are impaired by the removal of part of the tonsil.

Gleason reports that an actress told him that her singing voice had been ruined and her stage course ended after a

tonsil operation, and he has also had numerous complaints from adults that the voice was injured by an operation done years before.

F. E. Miller says incomplete removal injures; thorough removal raises the pitch and increases the amplitude of the voice.

Price Brown has had singing masters say that the voice was injured, but has never had that experience. He never removes the entire gland and is careful not to injure the pillars.

Professor Chiari says the power and range of the voice is changed in adults, so that he does not entirely remove the tonsil in adults, but only makes it smaller.

D. Crosby Greene, Jr., says that in two professional singers the voice improved in every way, but one month elapsed before effective singing could be done. If the uvula or soft palate is injured, there may be permanent change.

Coolidge says that professional singers have the voice thrown out of adjustment for some time.

George B. Rice, who treats a great many singers, says the voice is frequently changed somewhat, but is soon adjusted to the new conditions. In children a nasal twang may come on after the complete operation, but this disappears later.

Lack has found that singers sometimes entirely lose their singing voice, and public speakers, teachers, etc., find that they are unable to speak so well or so long as before the operation, and the use of the voice causes them a hitherto unknown aching feeling in the throat. This consequence of tonsillotomy in adults he has repeatedly met with, and does not think it is generally sufficiently considered. The greater the enlargement, the longer it has persisted, the greater the risk. A medical friend of his had his tonsils removed a few years ago, and not only did he have most alarming hemorrhage lasting nearly twelve hours and ending only on faintness, but at the same time he entirely lost his singing voice.

Levy reports stiffness of articulation for a time, soon disappearing.

Makuen finds the final results satisfactory, but singers may have to make changes in the use of the muscles.

T. P. Berens reduces the tonsils very slowly in singers, while Smyth refrains from the operation in trained singers.

Hajek says the quality of the voice is changed somewhat.

Luc, Lermoyez and Sir Felix Semon have never seen any bad results.

Ballenger finds the voice impaired for about six weeks, but the ultimate effect good.

I believe that the range and power of the voice should be increased, provided the pillars are uninjured, after complete tonsillectomy, as in many cases the tonsil, by its firm attachment to the pillars, especially if it is enlarged, hinders the mobility of the muscles. I have always believed that the reported cases of injury to the voice were due to the fact that the tonsil stumps were still present, hindering the mobility of muscular action, or else that the pillars themselves were injured by the operation.

CONCLUSIONS.

Further study of the physiology of the tonsil seems desirable, as it is still a question how important the tonsil may be at certain periods of life. If of value to the economy, the tonsils ought not to be removed to as great an extent as at present.

Under diseased conditions the tonsil is one of the avenues of entrance for the tubercle bacillus and for the specific organism of rheumatism, whatever that may be. There is sufficient amount of undoubted clinical evidence to show that it is also the avenue through which the infection enters in many other constitutional disorders.

The small submerged tonsil is quite as apt to be deleterious to the economy as the large one.

Local measures in the treatment of tonsillar troubles have their place.

Any condition in which it is evident that the tonsil is exerting a deleterious action upon the entire organism, and which cannot be averted by local treatment, is an indication for removal.

Ether is the safest general anesthetic.

According to the testimony of most observers, some form of horizontal position is the safest for general anesthesia, though the writer believes that the upright position, properly safeguarded, is equally safe.

Tonsillectomy should always be done in preference to tonsillotomy. Any method that completely removes the tonsil with its capsule, and with the least traumatism, is satisfactory.

The voice is improved rather than injured, provided the pillars are uninjured in the operation.

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LI.

CASE REPORTS.

By Lewis A. Coffin, M. D.,

SURGEON, THROAT DEP'T, MANHATTAN EYE, EAR AND THROAT HOSPITAL; LARYNGOLOGIST AND OTOLOGIST TO THE CITY HOME AND WORKHOUSE,

New York.

(A) CAVERNOUS SINUS THROMBOSIS.

While still at her country place, on the morning of October 4, 1908, Miss J. G., 59 years of age, was seized with a sharp and violent pain in the right anterior aspect of her head. For four or five days following, beside the severe pain located about and in the right eye, there was nausea and vomiting, and patient complained of a blowing or rushing noise. The nurse said she could hear the same noise with her ear at the patient's temple. About the fifth day after the onset of pain some bulging of the right eye was noticed and diplopia developed.

The temperature during this time was never over 99½ degrees F., nor did it rise higher during the subsequent history of the case.

On October 12th patient was moved to the city, and I being asked over the phone to call, was told of the severe pain over, and bulging of the right eye. Wrong as it may seem, my diagnosis of disease of the nasal accessory sinuses was made, and I hastened to make the call, prepared to confirm the long-distance diagnosis. I found patient in condition described, but history was not gone into as minutely as should have been done. The right frontal sinus was darker on transillumination than the left, and very tender on percussion and pressure. No discharge was seen in the nose. Drainage I believed to be blocked, and the eye condition due to pressure. Septum was markedly deviated to the right, and there was a broad ecchondroma on that side of the nose. Owing to this intranasal

condition and the temperament of the patient, who declared she would consent to no operation except under general anesthesia, I decided to do a radical Killian operation. I asked Dr. C. G. Coakley to see the case with me. He confirmed the diagnosis and agreed that a radical operation offered the best solution of the case; suggesting, however, that we delay operation to obtain a radiograph of patient's head. Dr. Caldwell made the exposure on the afternoon of October 13th, and on the morning of the 14th delivered an excellent negative, which showed cloudiness of both frontal and ethmoidal regions; greater cloudiness showing on the right side. A complete Killian operation was done in the afternoon. I was much surprised to find in the frontal sinus no pus, polypi or granulations. The lining membrane was, however, very thick from congestion as was the membrane lining the ethmoidal and sphenoidal cavities. Bleeding was very profuse, and although there may have been at some point a diseased cell or pus, I was not able to recognize it. Recovery from operation was uneventful, except for condition about the eye. Immediately the pain disappeared, and the exophthalmus was reduced and continued steadily to improve; but there developed a marked chemosis of the lower lid. Sixteen days after the operation, the chemosis persisting, I asked Dr. Egbart LeFevre to see the case. He gave as his opinion that we had been dealing with a thrombosis of the cavernous sinus, and said, further, that he believed that the operation had been of the greatest benefit, as by reducing the edema about the tissues of the eye by the extensive bleeding we had probably saved the sight of the eye if not the life of the patient. To reduce the coagulability of the blood as well as to break up any existing thrombus or clot, large doses of lemonade were ordered. A slightly astringent wash and light pressure were applied to the eye. Improvement in the chemosis was immediate and steady, and patient was considered well on November 12th. Her nurse left her on November 14th, and I find this entrance on her chart, "Patient in A No. 1 condition."

Thrombophlebitis is of traumatic or septic origin. In the region under discussion thrombophlebitis from traumatism may be ruled out. Herbert Parsons[1] says: "Thrombosis of the cavernous sinus may arise from extension from the

ophthalmic vein, the source of infection being wounds or septic infection of the skin, etc., or from the ear, nose, and accessory sinuses, pharynx, tonsils, etc., or as a metastasis in infectious diseases or septic conditions."

Thrombophlebitis is a progressive and cumulative disease, as long as the source of infection persists; but the source removed, the disease is marked by retrogression and self-limitation. The last holds good, of course, only when the source of infection has been removed before the disease has progressed to a point beyond repair.

H. Siguard[2] says the prognosis of thrombophlebitis is very gloomy, and he is inclined to believe with Parker that thrombophlebitis of the cavernous sinus is equivalent to a death warrant. He cites seven cases, however, in which recovery from a condition diagnosed as thrombosis of the cavernous sinus followed operation on and about the mastoid.

In my own case it is probable that the source of infection was in some one of the accessory sinuses of the nose, that by the operation the source of infection was removed. Much of the edema and pressure were removed immediately by the local blood-letting. Liquefaction of the clot and a re-establishment of circulation through the sinus was probably hastened by the administration of the lemon juice. This question then presents itself: given a case of thrombosis of the cavernous sinus in which no trouble can be found about the ear or elsewhere, which may be considered as the septic focus, would we be justified in doing a radical Killian operation in the hopes that the septic origin might be in some of the accessory sinuses of the nose? I believe we would.

(B) TERATOMA OF THE SOFT PALATE.

In the latter part of October, 1908, Mrs. H. R. consulted me on account of a tickling in her throat and a constant desire to cough on lying down.

Mrs. R. is a lady 66 years of age, very large, of a nervous temperament, and has very large varicose veins about the sides and at the base of the tongue. For years she has had what she calls strangling spells, the tendency to which has been well controlled by cathartics and nitroglycerin. When told of the tickling and cough I, not being in a condition at the

time to examine the throat thoroughly, thought probably it was caused by the varicose condition at the base of the tongue and prescribed accordingly. About ten days later, on the phone, I was told her condition was no better. The patient was asked to come to my office. With a small mirror, in the back of the throat I discovered what seemed a small tumor lying just behind and above the uvula, and of the shape of the uvula. Hooking the velum forward and up with the mirror, a tumor as large as my thumb hung free in the pharynx. I asked Dr. Jonathan Wright to see the growth in situ. Dr. Wright and myself both thought it to be a simple papillomatous growth. I snared off what I could of the growth through the mouth and gave it to Dr. Wright for microscopic study. His report was as follows: "This specimen is apparently primarily a teratoma; cells included in the tissue probably from embryonic life. They are apparently branchiogenetic cells. Unfortunately there are areas where the endothelium of the blood vessels is so infiltrating the tissue as to leave little doubt in my mind that we have here an endotheliomatous growth of serious import. The surface epithelium is hyperplastic, assuming the form of papilloma. Dr. Wright asked me to submit the slides to others for an opinion. Dr. Hodenpyl, of Columbia University, reports as follows:

"At your request, I have carefully examined two microscopic slides of a growth taken from the soft palate of Mrs. H. F. R., and have the following report to make:

The tissue consists partly of a new growth and partly of the underlying normal tissue. This latter consists of mucous glands, a loose stroma with blood vessels, etc. The growth itself consists of two parts. The major portion is composed of intercommunicating strands of squamous epithelium arranged in such a manner as to resemble a papilloma. On either border the growth is of different character. Here and originating in the columnar epithelium the growth is distinctly glandular in type. It gradually becomes atypical (i. e., bordering on carcinoma), and finally becomes merged into the papilloma.

The growth is infiltrated with a moderate number of leucocytes, and careful research reveals but a very few leucocytes.

I should regard the growth as a papillary adenocarcinoma,

and I think it took its origin just at the junction of squamous and columnar epithelium. From the specimen I gain the impression that the growth is not very malignant, at least, some of the signs denoting malignancy are wanting. Not knowing the history of the patient, I am unable to speak definitely upon this point. However, I would suggest the advisability of removing any remaining traces of the growth if there be such. Yours sincerely, EUGENE HODENPYL."

In accordance with the advice of Drs. Wright and Hodenpyl, I operated for the removal of the base of this tumor, which was situated in the median line just posterior to the septum, in the following manner:

Under cocain anesthesia a transverse incision from molar to molar was made through the tissues of the hard palate in a line parallel to and just anterior to its junction with the soft palate. The posterior flap thus made was dissected back until free of the hard palate, when the incision was carried through the soft palate into the nasal pharynx. The soft palate was then separated into two layers; the posterior containing the growth was cut out as near the Eustachian tubes as possible. The transverse incision was stitched up and healed by primary union, except for a small slough in the center. The opening thus caused was completely filled by granulation and contraction in about one month. Bleeding during the operation was practically nil. Dr. Wright has given much study to this growth and has made it subject of many consultations, and sends me the following report for this paper:

"In going over the reports of the case of Mrs. R.—which we made you from the laboratory without a view to their being incorporated in a report for publication—in looking over the sections and in considering the various expressions of opinion as to the tumor by competent histologists to whom the sections were submitted, there is so much conflicting evidence that I am unable to say more than that it was regarded as an epithelial growth of a malignant nature. I was inclined at first sight of the piece removed for microscopic examination to think it a teratoma of branchiogenetic origin, with evidences of malignant potentialities of a feeble character in certain cells, some of which were of endothelial appearance and some of an epithelial nature. On examining the whole tumor, there can be no doubt that the fimbriated extremity

from which we on inspection in the mirror made the diagnosis of a benign papilloma presented the structure microscopically which warranted it, but deeper down, closer to the base, were various appearances of graver import which, when revealed by the microscope, justified the operative course pursued.

Frankly, I do not know what name to give the growth, and a minute and exhaustive description of the objective appearances would extend this report beyond the limits suitable for your purpose. JONATHAN WRIGHT."

The soft palate seems to be a favorite field for the development of trouble-making tumors—trouble for the pathologist as well as the possessor.

They are often diagnosed as mixed tumors, but in several instances have been classed as teratoma. Serapin[3], in discussing these tumors, says:

1. The mixed tumors of the palate form a group by themselves from the pathologic, anatomic, and chemic point of view.

2. They have a common origin with teratomata and teratoid tumors.

3. From a clinical point of view they are benign in character, easy to enucleate, and not inclined to recurrence.

4. Garel[4] has reported a teratoma of the soft palate. Fullerton, R.,[5] has reported a teratoma arising from the right tonsillar region.

So far as I have been able to look the matter up, mixed tumors of this region have been reported by the following men:

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LII.

SOME RECENT CASES OF NASAL SARCOMA. SUBMITTED AS A COROLLARY TO A FORMER PAPER UPON THE SAME SUBJECT.*

By J. Price-Brown, M. D.,

Toronto.

It is acknowledged that in our professional life we should hold no secrets in the treatment of disease. Every method should be as open as the day. And if after long experience we have found faith in one method above all others, by which valuable lives have been saved, no matter how long and tedious may have been the path of the finding, it becomes our duty to proclaim it to others; and to continue to proclaim it until our confreres not only give us a patient hearing but also grant to the method a reasonable examination.

Six years ago I reported to this Association three cases of nasal sarcoma. All of them had exhibited the usual classical symptoms; continued obstructive growth, repeated hemorrhages, etc. All had been previously operated upon. All had been of long standing; and pathologic examinations of sections taken from each individual case verified each diagnosis. Two were reported at that time to be cured; one was still under treatment.

Four years ago I submitted a further report upon the last of the three. At that time it still required, occasionally, operative treatment at the basic spot, at the juncture of the posterior naris with the vault.

This necessity is now over, and two and a quarter years have elapsed since the last cauterization was made.

To-day all three men are perfectly well, following their usual vocations as bread winners for themselves and families. It is fourteen years since the first was last operated on; seven years the second, and over two years the third.

*Read at the annual meeting of the American Laryngological Association in Boston, June, 1909.

CASE 4. In the December issue of the ANNALS OF OTOLOGY for 1906 I reported my next case, of which I offer a brief note. The patient was a butcher, aged 58. His father had died of cancer of the stomach at the age of 72. On examination I found the left nasal passage from the anterior to the posterior naris filled with a dark, dense growth, which bled on being touched. After removing a section with a knife, microscopic examination by a pathologist proved it to be round-celled sarcoma. The treatment was on similar lines to that reported in the previous cases. In two weeks the growth was, seemingly, entirely removed, and the nasal passage cleared of obstruction. The growth in this case was from the outer wall, the middle and inferior turbinals being involved and softened. The electrocautery operations numbered seven or eight, being done at intervals of one or two days. At the expiration of the time mentioned there was complete restoration of normal breathing through that nostril. His temperature when he first presented himself was 99 2-5, and it continued more or less elevated throughout the treatment, running between 99 and 102 degrees. As the operative treatment drew to a close septic symptoms developed. He lingered about two months and then succumbed to them. He died, I believe, from the absorption of toxins from the site of the original tumor. There was, however, no return of the sarcoma, nor of inflammatory vegetations; and both the patient and his friends were spared the horrible and unsightly disfigurement and distress which usually attends death from this disease.

Taking this as one fatal case out of four, 75% of recoveries, have been the result of the electrocautery method of treatment, which was adopted in all of these cases—a fairly good showing, when we consider the far smaller percentage of recoveries which have followed the usual surgical methods of operation.

More than two years elapsed. Then, on April 1st, 1909, Dr. Kerr, of Toronto, referred:

CASE 5. Mr. C. C., age 35. His general health had been good, also his family history. He was a bachelor, and a weaver by trade. For several months there had been gradually increasing stenosis of the left nasal passage, and for the past few weeks complete occlusion, affecting even the right side. Taste and smell were both gone and the voice had a thick, nasal twang.

Examination.—Left nasal passage packed with a red, fleshy growth, which bled on being touched. On applying cocain and adrenalin, the tumor was found to be widely sessile and attached chiefly to the triangular cartilage of the septum. It extended to, but not into, the nasopharynx. A segment was at once removed by knife and submitted for pathologic examination. Drs. Carveth and Davis gave the following report:

"The specimen is for the most part composed of small, round cells with deeply staining, round nuclei and but little cytoplasm. There is a small amount of interstitial reticulum. There are many blood vessels with undeveloped walls, some showing only the endothelial lining, and in some cases they seem to be blood spaces rather than vessels. The microscopic examination, together with the clinical history, incline us to believe that the growth is a small, round-celled sarcoma."

Electrocautery operations were repeated almost daily for a period of two weeks, the sloughs presented being a portion of what was taken away during that period. By the time that the growth was fully removed the nasal passage was quite free and breathing had become normal again. For the six succeedings weeks he has been under observation. The sense of smell has returned, and for more than a month he has been doing his regular work. There is no indication of the redevelopment of the sarcoma.

Case 6. April 9th, Mr. W. S., age 20, was referred by Dr. Nicol, of Cookstown. For more than two years he had suffered from a constantly increasing growth in the right nasal passage. For the whole of this period he had lost the sense of taste and smell. Nine months ago the stenosis had become very severe, and, being referred to a surgeon, segments had been removed, by one means or another, from then until now —each one being attended by excessive hemorrhage. As the tumor continued to increase in size, he was finally brought by his family physician to the city and placed in the Toronto Western Hospital under my care.

I found complete occlusion of the right nasal passage by a red, inflamed mass, which extended from the anterior naris backward into the postnasal space. There it assumed a globular form and seemed to be attached to the right summit of the septum. It bore no resemblance either in attachment or

appearance to adenoid tissue. The slightest touch caused bleeding; yet, notwithstanding this fact, the hardness within the nasal cavity was so dense that, on first examination, I considered the obstruction to be partly due to a cartilaginous and bony ridge of the septum; which, after a free application of cocain and adrenalin, I attempted to remove with a saw. But the instrument met with neither bony nor cartilaginous resistance. It simply removed a mass of tissue which, upon pathologic examination, proved to be a portion of an angiosarcoma, as verified by Drs. Davis and Carveth, as follows:

"Examination of specimen from nostril. We find that this is an angiosarcoma, composed of small, round cells in a fibrous reticulum, having in it large and numerous blood vessels with thin walls. Myoxmatous degeneration is found in places."

The bleeding was excessive and nasal packing had to be resorted to.

On the 11th the tampons were removed, and electrocautery operations were done on the 12th, 13th, 14th and 15th of April.

On the afternoon of the 15th he had a severe rigor, and in the evening, when sleeping, had a large, involuntary movement of the bowels. Nasal operations were consequently suspended.

On the 18th the patient awoke in the morning with agonizing pain around the left ankle, on the side opposite to that of the sarcoma. This was followed by swelling. The treatment at first was by fomentations and subsequently by poultices; but the leg was not opened until May 3rd, when a large amount of streptococcal pus was evacuated. Several days later a smaller abscess was operated on on the opposite side of the foot. Since then the leg has completely healed.

To return to the sarcoma. On the 19th, the day after the chill, the nose was cauterized, but not again until the 29th, after which the cautery operations were repeated almost daily until May 17th, the rule being to cleanse the nasal cavity and anesthetize it with cocain and adrenalin, and then to cauterize as much of the growth as was deemed advisable each morning, and to follow this by an evening dressing.

By this time the nasal cavity was tolerably free from the growth all the way back to the nasopharynx. So, on May

18th, chloroform was administered, and a large portion of the nasopharyngeal portion of the tumor removed by means of a modified Lowenburg's forceps, and as the growth had been fissured in several places by the intranasal operations, this lessened the hemorrhage. The attachment was to the anterior part of the roof of the nasopharynx, to the septum, and also to the outer wall and the upper side of the soft palate.

Subsequently I operated almost daily with the electrocautery upon the fragments of the growth still remaining and upon the base of the nasopharyngeal pedicle. This could all be done by means of a strong light through the nasal cavity. These operations were continued until last Saturday, when the treatment was almost complete.

The nose is free, and practically all that remains of the tumor are a few disintegrating sloughs, which will soon cease to form. In this case, too, the sense of smell has returned. Still when I return I may find a few minor cauterizations necessary.

CASE 6. On April 12th, 1909, Mr. S. W., age 18, was referred to me by Dr. W. M. Brown, of Neustadt. The history in some respects was more severe than in the last mentioned case. For several years the left nasal cavity had been filled with a similar growth, extending into the nasopharynx, where it assumed a much larger size than in the case of Mr. S. During the last two years he had undergone very many operations by snare and forceps and cautery, each being attended by abundant hemorrhage.

On examination, I found nasal breathing on either side impossible. The left passage was filled by the growth swelling out in a roundish form to within half an inch of the nostril. The right side, while narrowed by the pressure from the opposite chamber, was filled with pus. In the postpharynx was a large, globular mass, completely filling it. He was at once placed in the Western Hospital.

I need not detail the treatment in this case, as it was on similar lines to the preceding one, which resembled the method practiced in all the cases I have reported.

In this, however, there was no preliminary operation of any kind to secure a section for pathologic examination. That was deferred until later, the daily cautery operations being commenced at once. As the main object was to reduce the size

of the tumor as speedily and as safely as possible, the attacks were made on the central part, leaving the shrinkage shell as a protector to the normal tissues. Consequently, although the sittings were long and tedious to the operator, they produced little pain to the patient. Little by little the heart was eaten out of the nasal portion of the tumor and the nasopharynx was reached. In the meantime I had discovered that the attachment was to the middle turbinal and upper posterior end of the septum and nasopharynx; and, like the former case, there was also an adhesion to the soft palate. Many sloughs were taken away during the first month of treatment, and the nasal cavity became quite free. Still, breathing through the nose was quite impossible, owing to the presence of the postnasal section of the growth, although several cautery cuts into it through the nasal passage had been made.

On the thirty-first day of treatment chloroform was administered, and the body of the tumor removed, post-nasally, with cutting forceps. The bleeding was severe, much more so than in the previous case just reported, and post-nasal packing had to be done. Two days later this was removed, when I discovered one piece of tumor still attached to the post-pharyngeal wall, low down and immediately behind the left posterior pillar. It presented the appearance of a hard, misplaced uvula. Another segment occupied the posterior part of the nasal cavity and was attached to the middle turbinal and the summit of the septum. These were both removed by electrocautery. Since then many other spots have required to be burned in the nose and post-nasal space, but all were done directly through the nasal cavity.

During the last week the improvement in every way has been very marked. There are now no vegetations of the growth to be seen anywhere, only sloughing spots from recent burnings, which are removed daily. Nasal respiration is perfectly free. The vault is open to the fullest examination. The affected nostril is much wider than the other one all the way through, and the posterior chaona at least three times the size of its corresponding fellow. The sense of smell, entirely absent for more than a year, has likewise returned. A noticeable feature, particularly marked in this case, is the ease with which any recrudescence of the disease could be attacked again *per vias naturales.*

In one respect the pathologic examination in this case differed from the preceding two. The section taken was from the center of the mass removed in the major operation from the nasopharynx. The report is here appended:

"I have examined the specimen of tissue from the nasopharynx, and consider the condition to be one of myxosarcoma. The myxomatous tissue, forming a greater part of the growth, is exceedingly vascular, the vessels as a rule having poorly developed walls, and in different areas of the growth there are masses of small, round cells, the individual cells being separated by very scanty stroma, which in places contains thin-walled blood vessels. The condition I believe is one of sarcomatous transformation of a myxomatous tissue.

Yours faithfully,

(Signed) H. B. ANDERSON,
Assoc. Prof. Clin. Med., Univ. of Toronto."

In reviewing these cases, it may be noted that the whole seven cases occurred in males; that the ages were, respectively, 18, 20, 21, 21, 35, 50, 58; and that two of them occurred in the right nasal passage, and five in the left. Three out of the seven have permanently recovered, one died, the fifth had no return six weeks after healing; and in the last two the growths have been removed, the patients being still under treatment. They were all private patients.

In view of these facts, I think I am entitled to present this subject in the light of research work, not in pathology, but in operative treatment; and, in doing so, there are several points I would like to touch upon, basing them upon the history of these cases, with the fourteen years' experience which they have afforded, and the fact that the process and results have made me a stronger advocate of the treatment here outlined than ever.

1. In sarcoma of the nose the usual site of origin is in the soft tissues, and not in the bony framework which supports them.

2. That the origin is usually in the form of a pedicle, which rapidly becomes sessile.

3. That as the sarcomatous mass enlarges and presses upon the surrounding mucosa, abrasions take place that are quickly transformed into adhesions. These in time may become almost coextensive with the disease itself.

4. These adhesions never attain the vitality and virile power possessed by the pedicle. Hence, when once destroyed, they are not likely to reform again.

5. Recrudescence, however, may take place in the region of the pedicle; and, in view of this contingency, this region should be kept under regular observation and control.

6. Owing to the fact that in many cases of nasal sarcoma the affected cavity becomes entirely filled by the hemorrhagic growth, that its adhesions are extensive and that it is impossible at the time of examination to locate them, attempts at intranasal removal by the ordinary knife are inadvisable; but that gradual and systematic dissection out by the cautery knife, in suitable cases, is a method which is always available and should be encouraged.

LIII.

PURULENT OTITIS MEDIA OF INFANCY AND CHILDHOOD.*

By H. O. Reik, M. D.,

ASSOCIATE IN OPHTHALMOLOGY JOHNS HOPKINS UNIVERSITY, SURGEON IN THE BALTIMORE EYE, EAR AND THROAT HOSPITAL,

Baltimore.

In selecting this topic for my paper I was influenced more by a desire for information than the hope of presenting to you anything new in relation to the subject. From both reading and observation I have conceived the idea that some members of the profession seem to look upon suppurative otitis media occurring in children as a different disease from that bearing the same name in adults. Certainly a different line of treatment is often recommended, and there appears to be some question as to whether the affection does not pursue a different course in the two classes of patients. I am led, therefore, to ask a question—does suppurative otitis media occurring in infancy or early childhood differ at all from that disease as observed in adult life, and, if so, in what respects? As forming a basis for discussion, I shall avail myself of the privilege of suggesting a few points wherein there may be grounds for supposing that the disease varies in some way, either as to its course of procedure or the response to treatment, and I trust you will not only discuss these, but add to the list any that have a practical bearing upon the question.

Purulent otitis media is an infectious disease, dependent, in the main, upon the action of the pyogenic microorganisms. We cannot suppose, therefore, that there is any difference in the etiology of the affection in the two classes of patients, at least in so far as the active agent is concerned.

*Read at the meeting of the Southern Section Amer. Laryngological, Rhinological and Otological Society, Richmond, Va., February 14, 1909.

It has been said that there are differences in the tissues upon which the germs have to work, that the younger, more nearly embryonic, tissue of the middle ear of the infant is more susceptible to inflammation and possesses less resistant power to the action of the pathogenic bacteria. I am by no means sure this is true; clinical experience does not furnish very strong support to the theory. That children are more susceptible than adults to middle ear inflammation is probably quite true, but the reason for this more likely lies in the factors that predispose to infection than in any peculiarity of histologic development of the tissues. The great prevalence of otitis media in young children has seemed to me to be largely due to the coexisting very great prevalence of adenoids and diseased tonsils at that period of life. The family physician is beginning to recognize the predisposing relationship of these affections to middle ear inflammation, but I sometimes wonder if even the otologist fully comprehends the intimate relationship often existing between nasopharyngitis, adenoids and tonsils and the progress and persistence of the middle ear disease. This point, bearing upon both etiology and pathology, may be considered one of the most pronounced differences in the disease, as viewed in childhood or in adult life. The etiologic influence we all teach, but do we always pay the proper amount of attention to the predisposing factor as a part of the aural treatment? Once the middle ear disease has started we are possibly too prone to devote attention principally or wholly to the ear, perhaps entirely ignoring the continued existence of such an important element in the original cause of the disease. It may be possible—in many instances it certainly is—to heal the aural affection by local treatment, but how frequently do we find that the otitis resists all treatment until the offending tonsils or adenoids have been removed? If these abnormal pharyngeal growths can occasion persistence of the otitis media, and if chronicity of the tympanic suppuration favors the development of more serious complications, how often might the latter conditions be prevented in children by an early recognition and treatment of the causative factor. The greater prevalence of adenoids, especially in early life than among adults, is an important difference in the etiology of otitis media in these two periods, and that adenoids and diseased tonsils may play an important

part in the pathologic course of the ear disease there can be little doubt.

This fact has brought about a discussion as to whether surgical treatment of the nasopharyngeal disease should be instituted immediately, as an essential part of treatment for the aural disease, or whether it should be delayed until the acute evidence, at least, of the otitis has passed away. So many possibilities enter into a consideration of a problem of this sort that it is exceedingly difficult to give an answer applicable to all conditions, but, as a general proposition, I believe it a wise rule to remove adenoids and tonsils, whenever they are found in connection with suppurative otitis media, at the earliest possible moment. Furthermore, I believe the operation should be a most thorough and complete one, for anything less than perfect ablation of the hypertrophied lymphoid tissue is fairly sure to be followed by a recurrence of the growth and a continuance or recurrence of the otitis. The day for tonsillotomies and partial adenoidectomies has passed, and only a skilled, trained operator can properly perform the modern operation of tonsillectomy, and as the adenoid operation is usually required and can be performed at the same time, it seems to me this organization should sound a note of protest against the attempted performance of these operations by the family physician unless he has adequately prepared himself for the task.

While considering possible differences in the pathology of otitis media at different stages of life, we might well ask whether the disease is more destructive in early than in adult life and whether complications are of more frequent occurrence.

My own answer to this query would unhesitatingly be in the affirmative. I do not mean that we see more cases of meningitis, sinus thrombosis, or brain abscess among children than in adults, but are there not other important complications occurring to children that are not so well recognized? It is a matter of common observation that spontaneous perforation does not occur so early nor so readily in children as in adults. Some have supposed that the tympanic membrane is thicker or more resistant in the young. I am not aware of any anatomic proof of that idea, but it is not a point of great practical importance. A more probable explanation of the non-

rupture of the drumhead is that it is not subjected to the same strain as in the case of the adult; owing to the greater patency of the tympanopharyngeal tube, an accumulating secretion in the tympanum will force an exit in that direction before it reaches a degree of tension sufficient to effect a break in the membrane. In infants and young children, therefore, we probably have in cases of suppurative otitis media a more or less constant escape of infective secretions from the tympanum into the nasopharynx, and this material is swallowed, into the gastrointestinal tract, or by way of the larynx and trachea reaches the pulmonary structures. Aural examinations are not a common procedure in the day's work of the average physician, and the diagnosis of otitis media purulenta is not made by inspection of the tympanic membrane, but, as a rule, by the flowing of pus from the external auditory meatus. Now, if the membrane does not rupture and pus does not appear in the canal the child passes through a period of obscure febrile disease until, after a lapse of a week or ten days, the condition is diagnosed as enteritis or bronchopneumonia. Not a small number of these unfortunate children die of the secondary disease, or a general septicemia, without the primary affection having ever been suspected; autopsy records show a surprisingly large number of such cases. Of the greater facility with which purulent otitis media may invade the cerebral cavity in the young, because of the unclosed petrosquamosal suture or other dehiscences in the bone, we need hardly speak. It is an obvious fact that complications of suppurative otitis media occur with greater frequency than in adults, and that, therefore, it is extremely important that the primary ear disease should be recognized at the earliest possible moment and proper treatment instituted to cure the local disorder or prevent its spread.

Are there any differences in the symptomatology dependent upon age? I have already mentioned the possible delay in the appearance of otorrhea due to the tardiness of spontaneous rupture of the tympanic membrane. The fever accompanying otitis media in children is apt to be of a higher degree than that of adults, but as this is true of all children's disorders it is not a matter of special clinical value. The only differing symptom that has particularly impressed me refers to the onset of complications, really to the onset of mastoiditis.

I have frequently found it rather difficult to determine whether a child was developing mastoiditis, or, having shown some evidence of this involvement, whether the mastoid disease was increasing. Variations in the subjective symptoms of pain and tenderness cannot be accurately gauged in children; indeed, it is often difficult to determine whether tenderness actually exists. Blood examinations are of service, of course, in such cases, but there is one objective symptom—enlargement of the posterior cervical glands, either superficial or deep—that has seemed to me a reliable indication of mastoidal involvement. I am inclined to the opinion that these glands are usually enlarged in young children suffering with mastoiditis, and that their palpable presence in any case of purulent otitis media of infancy demands most careful consideration. If the glandular swelling persists for several days, and the other evidences of an infection are not abating, a mastoidectomy had better be performed.

This brings us to the consideration of treatment; is there any difference here to be based upon the age of the patient? I think not, except that, from what I have said regarding the gravity of the disease in young children, as compared to adults, there is greater necessity for the prompt application of the generally recognized therapeutic laws. We should endeavor to teach the family physician the necessity for making aural examinations in every case of obscure febrile disease occurring in young children, and that he errs on the safe side, if at all, when he has the tympanum opened early. A clean incision of the healthy tympanic membrane does no harm, and it is far better to open an infected tympanum one day too soon than one hour too late. It is not safe to wait for spontaneous rupture of the membrane in a case of acute otitis media. Again, when there are symptoms indicating a spread of the middle ear disease to the mastoid or neighboring structures an operation should follow with the slightest delay. We are all familiar with the marvelous recuperative powers of children, and have observed the rapidity with which they respond to proper treatment; here is a marked difference in their favor that should be taken advantage of, for, if given half a chance, they make record recoveries.

In conclusion, reverting to the question which formed the basis of this paper—does suppurative otitis media occurring

in infancy or early childhood differ at all from that disease as observed in adult life, and, if so, in what respect?—I would say:

1. There are no fundamental differences in the disease as seen at different periods of life. Suppurative otitis media is a distinctive clinical entity, is caused by any one of a certain group of pyogenic microorganisms and progresses according to a definite pathologic course.

2. Owing to the prevalence of abnormally developed lymphoid tissue in the nasopharynx of young children, they are more susceptible than adults to aural infections.

3. Because of certain well recognized anatomic differences the opportunity for extension of the infection to other organs and structures is much greater in children than in adults, and the disease, therefore, becomes one of more serious consequence.

4. The greater gravity of the affection requires that the physician should be more alert in diagnosing it in children during the earliest stage and most prompt in applying the treatment appropriate to the stage at which the diagnosis is made.

LIV.

OTOSCLEROSIS: TREATMENT.

By W. Sohier Bryant, A. M., M. D.,

New York.

In 1892, while the author was connected with the Massachusetts Charitable Eye and Ear Infirmary, Dr. E. D. Spear demonstrated to him the relation between what was then called otitis media catarrhalis insidiosa—now called otosclerosis—and the nasopharynx, and showed how the otosclerosis could be controlled by applications made to this part of the upper air tract. The object in view in these cases of otosclerosis is to bring the mucosa of the upper air tract into as normal a condition as possible, and, also, by iritating the mucous membrane, to cause a counterirritating effect on the ear.

For the counterirritant the author uses a solution of nitrate of silver of from 5 to 10 per cent strength, or a saturated aqueous solution of ammonio-ferric sulphate, taking the precaution not to push the effect to much local reaction. The applications are made through the inferior nasal fossae to the back and side walls of the nasopharynx. At first the treatment is repeated every day, for three to seven days, then at gradually lengthening intervals, and is discontinued when the mucosa and ear seem to have ceased improving. Should the exigencies of the case demand it, general constitutional treatment, and local ear treatment, such as inflation, etc., should be instituted, in addition to this counterirritating measure. The beneficial effects of the treatment are soon apparent in the improvement in the hearing, which improvement generally lasts for a long time.

A continuous series of 31 cases, treated according to the method outlined above, gave the following results: All of these cases had shortened time of bone conduction, while they had relatively increased bone conduction. The hearing tests given are for air conduction. No case had any history of

middle ear suppuration. The following five cases are sufficient as examples of the entire series:

CASE 1. Woman, 38 years old. Mother, father and grandfather deaf. Loud various tinnitus and deafness commenced at 23 years of age. Normal tympanic membranes and tubes; manubria malleorum pink, movable. Watch not heard; Politzer acoumeter—right ear, 6 inches; left ear, 1 inch; high tone limit—both ears—21,000 S. V.; low tone limit—both ears—156 S. V. The patient received two treatments each week for five weeks. These treatments consisted of general tonics and hygiene, nasal insufflations of powdered suprarenal gland, applications of solutions of $AgNO_3$ gr. 40 to dr. 1 of water to the nasopharynx, and vibratory massage about the ear.

Results.—Hearing much improved, tinnitus relieved. No congestion of manubria malleorum. Watch not heard. Politzer acoumeter—right ear, 48 inches; left ear, 5½ inches; high tone limit—both ears—26,000 S. V.; low tone limit, 26 S. V. Improvement maintained while under observation for four years.

CASE 2. Man, 42 years of age. Family history of deafness—great-uncle, two uncles, and one aunt out of seven, four cousins, deaf, two of the latter deaf only when old. Deafness commenced at 17 years of age; occasional tinnitus and vertigo. Normal tympanic membranes and tubes; mallei pink and movable; promontories appear pink through the membranes. Watch not heard; Politzer acoumeter—right ear, 5½ inches; left ear, 12 inches; high tone limit—right ear, 30,000 S. V.; left ear, 21,000 S. V.; low tone limit considerably raised. The treatment was chiefly directed to the maintenance of hygiene, and to the insistence upon more regular habits and less stimulants. Two or three times a year applications were made to the nasopharynx of a 10 per cent solution of nitrate of silver or saturated solution of ferric alum. This treatment covered a period of four years.

Results.—Slightly improved hearing. Relief from tinnitus and vertigo. No congestion of mallei and promontories. P. acoumeter—right ear, 9 inches; left ear, 24 inches; high tone limit—right ear, 31,000 S. V.; left ear, 28,000 S. V.; low tone limit—right ear, 128 S. V.; left ear, 113 S. V. Improvement maintained while under observation during seven years.

CASE 3. Man, 43 years old. Paternal grandfather deaf. Deafness began at 25 years of age; various tinnitus. Tympanic membranes and tubes normal. Watch—right ear, 4 inches; left ear, 2 inches. Treatment consisted in nasal insufflation of suprarenal glands twice a week. Once or twice a month applications of saturated solution of ammonio-ferric sulphate were made to the nasopharynx. This treatment was continued for three years.

Results.—Hearing much improved and tinnitus relieved. No change on inspection. Watch—right ear, 36-inch watch heard 10 feet; left ear, 7 feet; high tone limit—left ear, 49,000 S. V.; right, ear, 53,000 S. V.; low tone limit, 28 S. V., both ears. Improvement maintained while under observation for nine months.

CASE 4. Woman, 45 years old. Family history of deafness. Deafness commenced at 33 years of age, following childbirth; tinnitus. Normal tympanic membranes and tubes; membranes show promontorial blush; manubria malleorum pink; mallei movable. Watch not heard; Politzer acoumeter—right ear, 1 inch; left ear, 1½ inches; high tone limit—right ear, 15,650 S. V.; left ear, 21,000 S. V.; low limit raised; Gelle test negative. No change in bone conduction on compression of air in external meati. Treatment consisted in nasal insufflations of adrenal gland powder twice a week at first. Later the treatment was given every two or three weeks. Applications of supersaturated solution of persulphate of iron above the lower turbinates were made at first twice a week. Treatments were later given every two weeks, and were continued for 16 months.

Results.—Hearing and tinnitus improved. No congestion of mallei and promontories. Watch not heard; Politzer acoumeter—right ear, 8 inches; left ear, 6 inches; high tone limit—right ear, 16,500 S. V.; left ear, 22,400 S. V.; Gelle test still negative. Improvement maintained while under observation 15 months.

CASE 5. Man, 24 years old. Mother and brother deaf. Deafness one year with tinnitus. Normal tympanic membranes and tubes. Treatment consisted of nasal insufflation of suprarenal gland powder. Applications were made to the nasopharynx with nitrol of silver solution 40 gr. to the ounce. The treatments were given about every six days and were continued

for two months. Watch not heard. Politzer acoumeter—right ear, 12 inches; left ear, not heard.

Results.—Hearing much improved and tinnitus stopped. No change in appearances. Watch—right ear, 6 inches; left ear, 48 inches; Politzer acoumeter—right ear, 8 feet. Improvement maintained while under observation for four years.

Conclusion.—Otosclerosis is amenable to treatment, with the expectation that in most cases the process of otosclerosis will be arrested and the hearing improved. The more advanced the case, the less benefit will be derived from treatment. Very advanced cases, however, can be benefited to a degree.

LV.

CHRONIC PURULENT OTITIS MEDIA IN ADULTS.*

By S. MacCuen Smith, M. D.,

Philadelphia.

In discussing the pathology of suppurative otitis media, we have two processes to consider, especially in relation to its subsequent invasion of the mastoid cavity, through which it passes, and the changes incident thereto. The first produces a condition of malnutrition, in which the intercellular structure is destroyed, finally converting the several spaces into one large cavity. A continuation of this process of absorption by a persistent invasion of the greedy leukocytes and osteoclasts renders the cortex exceedingly thin, resulting in erosive perforation. On the other hand, the osteitis may terminate in resolution, or, as is more frequent, in osteosclerosis, the exudate being converted first into fibrous tissue, which gradually undergoes ossification and becomes dense bone.

The second form presents the characteristics incident to hypernutrition, which, after passing through various abnormal histologic changes, produces the condition known as sclerosis of the mastoid cells, condensing osteitis, or hyperostosis of the same process. A chronic inflammation of the mucosa lining the tympanic cavity and antrum produces a secondary hyperemia of these structures, enveloping the pneumatic cells, which in turn becomes chronic, and this in time, owing to an increase of cellular structure, entirely obliterates the pneumatic spaces, eventually producing a solid, eburnated mastoid process.

This condition, having its origin during a suppurative otitis media, may continue after all tympanic discharge has ceased. Furthermore, it is during the course of such pathologic changes that the sinus is frequently pushed so far for-

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ward that the posterior osseous canal becomes the anterior wall of the sinus, the antrum is partly or completely obliterated, and we are apt to find the tympanic branch of the facial nerve in an abnormal position, the changed relations rendering the performance of a mastoid operation most difficult. Pain or neuralgia in the vicinity of the mastoid may also be attributed to the same process, and should make us more mindful of such conditions, even though the ear is dry and has not been the site of a suppurative lesion for some time.

I wish to reiterate the fact that in my experience a chronic recurrent suppurative otitis media is relatively productive of more complications, intracranial and otherwise, than the continuous variety. The danger point appears to be during the period of the acute exacerbation, which seems to be productive of lighting up an old abscess formation or a chronic labyrinthine disease, both of which nature may have walled off by protective coats, thereby causing them to remain latent until aroused to action as the result of an acute exacerbation.

Gruber defines cholesteatoma as small, degenerated epithelial cells, between which lie cholesterin crystals and other fatty deposits. If we are to adhere strictly to the composition thus defined, we must conclude that true cholesteatomatous masses are not so common as some would have us believe. In any event, we are all familiar with the great frequency with which we find larger or smaller masses of desquamated epithelium within both the tympanic cavity and the mastoid process, and furthermore, we have learned from experience, and probably sad experience, that this formation of what we are pleased to call cholesteatoma is the result of a chronic suppurative otitis media, and, moreover, is frequently the chief etiologic factor in the development of a majority of the serious intracranial complications that we are called upon to treat. In other words, as aurists we are confronted with a disease of the osseous structure, the etiology of which, in consequence of this peculiar formation, is unique and serves to distinguish it from diseases of bone in any other part of the human economy.

Some authors properly regard this subject as of sufficient importance to be treated as a separate disease, and yet from the fact that it is dependent upon an otorrhea for its existence, as well as clincally inseparable from the same, it must remain an important development of chronic suppurative otitis media.

Without warning, and in the absence of symptoms, this formation slowly develops and advances until accumulating coats, one upon another, assume such proportions that finally the patient, from pressure necrosis, is warned that the temporal bone is the site of a grave lesion.

An immediate radical operation at this time will, in all probability, eradicate the disease, while delay will favor the rapid development of some serious endocranial complication, the exact nature of which is governed by the location of the mass and the direction of its pressure erosion. The symptoms resulting therefrom will determine the route which surgical measures for relief should take.

The pathologic changes caused by a chronic suppurative otitis media necessarily differ from those resulting from the acute disease, and usually develop from heedless neglect of the primary lesion.

During the acute disease the mucosa becomes macerated and peels off, exposing the unprotected and defenseless osseous structure to the ravages of the various microorganisms present. By this process is ushered in the grosser pathologic changes, which mark the beginning of bone erosion and all the serious intracranial and general complications incident thereto. Eventually, granulation tissue replaces the normal mucous lining, and the consequent proliferation may be sufficient to fill the entire middle-ear cavity and extend into the antrum and cells. The outward extension of granulation tissue through this process of proliferation may fill the external osseous canal, and finally, after passing through various histologic changes, result in a polypoid growth sufficiently large to reach the concha.

Coincident with the above, the ossicles and tympanic walls become necrosed and exfoliation takes place, which finally results in the middle ear becoming emptied. In the meantime the labyrinth may have become implicated, and the mastoid process will almost assuredly have suffered from disintegration. If, however, the fenestrae escape injury and the stapes remain fairly movable, the hearing power will continue good. On the other hand, should the ossicles remain in situ and become ankylosed or firmly fixed by fibrous bands, or the membrane covering the fenestrae become opaque or calcified, great loss of hearing must result. Masses of epithelial scales from the

external canal may pass through the perforation in the membrana tympani, coat the walls of the tympanic cavity, reach the attic and antrum and there form cholesteatomatous masses.

The presence of cholesteatoma and the character of the discharge are valuable aids in determining the advisability of operative interference. The generally accepted rule today is that we should advise immediate operation when convinced that cholesteatoma is present in the tympanic cavity, especially the superior part, and the mastoid antrum or cells. Indeed, this rule holds good if there is even a strong probability that the same exists. We must not, however, confuse the diagnosis on account of the presence of desquamated epithelium in the external auditory canal, as cases do undoubtedly exist where laminae of epidermis in considerable quantity are present in the canal, but have not entered the tympanic cavity through a perforation. Cases of this character will yield to non-operative treatment, and should be carefully differentiated.

We should recognize three distinct types of otorrhea; the first and most common is that having its origin in the nasopharynx and the Eustachian tube, which is ropy and mucoid in character; that arising from the tympanic cavity alone, which is less abundant and yellowish in character; while a discharge brownish-yellow or greenish-yellow in character, and having a decidedly offensive odor, indicates extensive bone erosion, occurring more frequently in the tympanic attic and mastoid antrum. All these regions may be involved at the same time, and in long-standing cases this is frequently true. A further diagnostic sign in these cases is the appearance of blood, indicating the presence of granulation tissue, which in turn is usually an outgrowth of carious bone.

We must not lose sight of the fact, however, that non-fetid pus frequently contains large quantities of pathogenic cocci, which are highly infectious and just as dangerous to life as the more offensive type of discharge.

The question as to the particular line of treatment to be instituted in the chronic suppurative disease of the ear is still agitating the professional mind. While all of us may have operated unnecessarily on some of these chronic cases, yet on the whole I venture to say we are probably too conservative, as

shown by an unfortunate occurrence in some particular case where ultra-conservatism dictated the treatment.

The great difficulty heretofore, as at present, has been our inability to appreciate the destruction that is slowly but surely taking place through carious erosion within the temporal bone. Certainly a fair proportion of patients presenting granulation tissue and polypoid growths will yield to properly directed non-operative treatment, except in so far as surgical means are necessary for their removal. Those of us who conduct large clinics are continually being impressed by this fact, and it is a daily occurrence for us to examine cases with marginal cicatrices and perforations, the results of middle-ear suppurations which have healed without operation, in which state they have remained for years. It would seem, therefore, that notwithstanding granulation tissue may be the outward expression of circumscribed carious destruction, the latter will frequently yield to non-operative treatment of the major type. It is generally conceded that in the absence of urgent symptoms we should not recommend radical operative interference until the more simple lines of medication have been exhausted, and furthermore, the radical operation should not be performed in the average case until minor surgical measures have failed. It is probable that a limited amount of caries and even cholesteatoma are not of themselves absolute indications for the radical operation, but if to these are added the symptoms of an acute exacerbation, or some intracranial, sinus, or labyrinthine complications, the surgeon should immediately operate. If the case fails to yield to the removal of granulation tissue and polypoid growths, if such are present, as well as to properly directed medication, and still presents no special indications for more radical measures, it would become our duty to first resort to ossiculectomy and removal of all pathologic products that can be reached through the external auditory canal. As to choice between this measure, however, and a modified operation known as the Heath, I have reason to express some preference in favor of the latter. In a paper on the subject, read before the Eastern Section of the American Laryngological, Rhinological and Otological Society, at Philadelphia, on January 9th of this year, I exhibted some patients, who showed in a striking manner the benefits of the modified procedure. Heath's con-

tention is that the mastoid antrum is usually the site of the continued suppuration, rather than the cavity of the middle ear. Such being the case, we can readily appreciate why the removal of the ossicles and membrana tympani does not correct a discharge the origin of which is in the mastoid antrum or cells, as these cavities cannot possibly be reached through the external auditory canal.

Then, again, the preservation or improvement of hearing, especially if both ears are involved in childhood, is a matter of the greatest importance. Ossiculectomy will undoubtedly improve temporarily the hearing power in the majority of cases. This, however, will almost assuredly decrease gradually in the course of time; whereas, in the Heath operation, we preserve the membrana tympani and ossicles, or any fragment of the same that remains, the natural tendency being, therefore, toward a betterment of the hearing power as well as the correction of the discharge.

From a purely surgical viewpoint, it does not seem sound operative technic to deliberately retain pathologic products, however minute, within the organ of hearing, and yet a goodly number of the cases seem to justify the procedure, from the fact that it not only preserves the hearing power present at the time of operation, but actually improves it to an appreciable degree in the majority of cases. Then, again, it is suitable in both the advanced acute and chronic variety of cases and will probably supplant the operation known as ossiculectomy for the cure of an otorrhea.

If the Heath operation is advised, this should be done under the same conditions as would an ossiculectomy; in other words, the operation should be continued to a radical at some future date, in case the patient is not relieved by the simpler procedure.

LVI.

SPOON ENUCLEATION OF THE TONSIL.

By A. Morgan MacWhinnie, M. D.,

Seattle, Wash.

The value of any tonsillar operation consists in the thoroughness of the enucleation. Consequently no tonsil operation should be considered thorough unless the capsule be included in the enucleation. The question of hemorrhage is usually what alarms most operators, but if the tonsil is removed with the capsule intact, regardless of the teaching that may exist from previous operators, it is my experience that bleeding instantly stops. That we occasionally have a stubborn hemorrhage of the oozing variety is probably due to the fact that the tonsil capsule is composed of fibrous tissue. Fibrous tissue, as we well know, does not possess a great deal of contractility. Existing between the carotid side of the capsule and the superior constrictor muscle there is a varying amount of connective tissue, this possessing a greater amount of contractility than the capsule itself. Consequently, when a tonsil has been enucleated and a part of the capsule remains, we lose this contractile power which is necessary for the closure of the blood vessels, thereby preventing hemorrage, when no injury has been inflicted upon either the anterior or the posterior pillars. When bleeding continues it is fair to assume that some portion of the tonsillar capsule remains, for these arteries pierce this capsule and ramify through the tonsil. Hemorrhage might also takes place if in the enucleation some fibers of the supra-constrictor muscle may have been brought up as well. This can be readily obviated by the use of the instrument which I have devised. Secondary hemorrhage is practically unknown if the details as above have been carried out. I believe if the anatomy was better understood we would not have any amputations or punching of this tonsillar tissue. At its best, part of the capsule still remains, and the added danger of injury to the superior constrictor ensues. Using the various punches, it is

almost impossible to empty the supratonsillar fossa, where 90 per cent of our abscesses occur. While it is generally conceded that a clean-cut surface will heal more quickly and is less liable to infection, it has not been my experience to have had any infection or to have the healing process delayed beyond a period of about ten days after using the tonsil spoon, when healing is complete. I do not deem it necessary to massage this fossa during the period of healing, as suggested by Pynchon, because a certain amount of irritation is thereby caused, and exuberant granulations are liable to spring up, necessitating their removal. Careful cleansing with an alkaline wash, followed by a 50 per cent argyrol solution, constitutes the only treatment that is necessary after enucleation of the tonsil in the intact capsule. True it is there are some cases in which this fossa does not fill with connective tissue under four or five weeks, but this is the exception and not the rule.

The methods by which enucleation may be done are numerous and vary with each operator, and he may have some special device of his own which seems to suit his method. The danger of using a knife in the separation of the pillars and the extirpation of a tonsil is such, that only when we have an extremely tranquil patient and are exceedingly dextrous in its use, are we justified in using it in the separation of the tonsil from the connective tissue. While the advocates of the knife use the blunt end to separate the tonsil from the connective tissue, using the sharp portion only to separate the pillars, by means of my spoon the pillars are separated as well as the tonsil. Obviously the knife can only be used by a very few.

The method of removing with the finger is undoubtedly the best, causing the least trauma, as well as possible injury to the surrounding parts, and undoubtedly as quick as any. Ether is generally necessary for such cases, but there are some patients who object to a general anesthetic for this purpose. While I have enucleated a number of cases under cocain by my finger, in 15 to 20 seconds usually, the patient gags and retches to such an extent that the time of removal is lengthened and possible injury to surrounding parts increased. With the idea of overcoming this I have devised the spoon shown in the cut, by which the tonsil is removed, with the capsule intact,

with a minimum amount of loss of blood, and leaving a fossa which readily heals in a period of a week to 10 days. A 10% cocain and adrenalin solution is injected at two points between the anterior pillars and the tonsillar capsule, and at two points between the posterior pillars and the tonsillar capsule, corresponding with that made anteriorly. An ordinary hypodermic, or, preferably, a Luer glass, syringe is used, but a special gold needle four inches long is attached, which allows a deep penetration. A lapse of five minutes is allowed, so that anesthesia becomes complete. The tonsil is then grasped well into the supratonsillar fossa and the infratonsillar fossa, so as to engage the capsule as well as the tonsil. Otherwise we might grasp the tonsillar tissue, which is soft and readily tears out. I believe this is the point where failures are often made in enucleation. A tongue depressor is not necessary,

the handle of the volsellum taking its place. The spoon is then entered between the posterior pillars and the tonsillar capsule, rapidly separating from below, upward to the supratonsillar fossa. The spoon is then moved rapidly forward, separating the tonsil as it comes forward from the connective tissue beneath. The same process is carried out inferiorly and anteriorly. This spoon has semi-sharp edges, which act better as a separator on the connective tissue than a sharp instrument would do, without the added risk of leaving some of the capsule. The spoon fits so accurately over the tonsil that injury to the pillars should not be considered. The extreme traction by means of the volsellum brings the tonsils so well forward into the pharynx that it leaves very little separation necessary. many changes that were necessary to make this spoon of practical value.

LVII.

CHRONIC EPIPHARYNGEAL PERIADENITIS IN ADULTS.

By Jas. E. Logan, M. D.,

Kansas City.

As its name implies, this is a disease of the tissues in the vault of the pharynx. The writer is not content with the term periadenitis—as interpreted literally it would indicate that the structures surrounding the glands are alone involved, while it is intended to comprehend a pathologic process extending throughout the glandular, muscular, vascular and connective tissues.

In 1903 I read before this association a paper entitled "Adenoid Growths with Special Reference to Adult Condition," in which I recited my experience in operating upon sixty-five cases of adults over twenty-five years of age. I shall attempt to give further proof of the importance of recognizing this as a distinct disease deserving a separate classification along with other inflammatory processes of the upper respiratory tract. Writers upon this subject have generally considered this condition as an extension of inflammatory processes either from the nose or from the pharynx into the epipharynx, making this a secondary and not a primary affection. In the light of our experience, we are convinced that in these structures are developed the etiology and pathology of many diseases which have baffled the efforts of our greatest men in the sphere of investigative research. We have been taught to believe that after the age of puberty has passed, the lymphatic glands undergo atrophy and ultimately disappear, and clinical facts bear out the fact of this statement within certain limitations. Whenever the age of childhood has passed without establishing pathologic processes of a chronic nature within these structures, then atrophic changes take place that very soon obliterate their existence. But whenever chronic inflammations once become installed, they seldom, if ever, dis-

appear. In entering upon the discussion of the pathology of this disease we shall not attempt to go into the details of the acute forms of this affection, leaving that to some future time.

In 1868 Luschka described indefinitely a chronic disease of the nasopharyngeal bursa, to which he gave the name "Chronic Nasopharyngeal Bursitis." Later, in 1885, Thornwaldt gave a more detailed account of this affection, to which our textbooks have ascribed the name "Thornwaldt's Disease." D. Braden Kyle refers to it in the last edition of his work as a suppuration of rare occurrence in the pharyngeal bursa presenting symptoms very similar to those of empyema of the sphenoidal sinus—the latter condition he regards the more frequent. Ballenger mentions it as a disease of the recessus medius due to inflammatory adhesions of the median borders of the adenoid mass. Schwabach regarded it as a disease of congenital origin, situated in the remnant of the middle cleft.

In determining the actual pathology of this disease I have submitted a number of these growths to Dr. Frank J. Hall, of Kansas City, who has spent much time investigating the characteristics, and I am indebted to him for valuable aid. I give his report at length: "The tissue removed from the epipharyngeal region of Mr. D. by you and sent to me for microscopic examination and description presents the following: The gross specimen is roughly circular, one inch in diameter and three-eighths of an inch thick. Sections made at right angles to the surface present the following: The covering is squamous epithelium, which is broken at one point by an ulcer whose floor is composed of polymorphonuclear leucocytes held in a reticulum of fibrin. At one other point the surface epithelium is being invaded by leucocytes and round cells. This area lies directly over a lymphoid deposit resembling tonsillar tissue.

"Beneath the epithelium at all points the submucosa is liberally infiltrated with round and polymorphonuclear cell exudate. Here and there is a deposit of lymphoid tissue whose lymph sinuses are choked with inflammatory products. Deeper down, groups of mucous glands are encountered. The lumina of these glands are wide and filled with a liberal amount of secretion. About the glands just mentioned are liberal deposits of inflammatory round cells of the plasma of the small leucocyte type. In the planes of connective tissue at the level of the mucous glands is a noticeable amount of fibrin, almost

sufficient to constitute a severance of the overlying submucosa from the gland-bearing area. Still deeper, planes of voluntary muscles are encountered. Between the individual fibers of the muscles is a great quantity of inflammatory material, both cellular and fibrinous, constituting a real interstitial myostitis.

"Throughout all the section and particularly marked in the upper layer of the submucosa are many degenerated nuclei of the proper connective tissue. These degenerated nuclei are drawn out in the most bizarre fashion into clubs, strings, etc. No giant cells or other specific histologic cell elements or arrangement of same is noticeable. Blood vessels are all the seat of thickening of the intima and media."

You will observe from Professor Hall's report that this disease does not alone involve the glandular structure, but extends to the muscular, vascular and connective tissues as well. We believe this to be of especial importance with reference to the muscles concerned in the function of hearing. The tensor tympani, tensor palati and the levator palati are to be mostly considered in this connection because of their attachments into and around the orifice of the tube, influencing as they do the action of the drum membrane, together with the effect upon the lumen of the tube, by the opening and closing functions of the levator and tensor palati. These muscles originate in and around the orifice, and any inflammatory process in adjacent tissue undoubtediy involves these fibers and must of necessity interfere with their physiologic action. This might serve to explain the yet unsettled theories of sclerosis of the middle ear. Chronic catarrhal inflammation of the middle ear has been the bugbear of every pathologist. He has never been able to establish its identity. We know that these cases progressively increase in deafness, even when they are given the very best attention. In the light of these facts, it is already evident that either these conditions are irremediable or the etiology, pathology and its elimination are yet unknown. Buck, in his third revised edition, p. 41, says: "As yet we are unable to form any very accurate idea of the extent to which the impaired hearing in this class of cases (referring to chronic catarrhal deafness) is to be attributed to the abrogation of the functions of the tensor tympani and stapedius muscles. The sclerosing process undoubtedly invades both of them, and to a greater or less extent paralyzes their action; and it is also conceivable that in

certain cases a state of permanent contracture may be produced whereby the membrana tympani on the one hand and the stapedio-vestibular-annular ligament on the other are kept by these muscles permanently in an abnormal state of tension."

Retraction of the membrana tympani is more often dependent upon the lack of resiliency of the tensor tympani than upon any perceptible encroachment upon the lumen of the tube. This fact can be proven in a large proportion of cases by catheterization. It can also be proven by the unimpeded introduction of the bougie through the tube. If the tube permits of the entrance of air and also of the introduction of the bougie, then why does the membrana tympani remain retracted? The answer to this question seems to me to be found in the foregoing statement, viz., the lack of the resiliency of the tensor tympani. Admitting that sclerosis (a process hard to define) does become established within the drum, then it must have a cause, and that cause in a great majority of cases is to be found in a diseased condition of the epipharynx. This disease may exist indefinitely without producing any disturbance in the function of the ear, though this is the most frequent complication.

Whenever the tissues in the vault have been the seat of repeated attacks of acute inflammation, supervening upon the chronic process, we have found these patients frequent victims of acute rhinitis and of epidemic influenza. The reason for this lies in the productiveness of this soil for the cultivation of all forms of pathogenic bacteria. In forty-two cases of acute epidemic influenza in adults, in which were found the catarrhalis, every one exhibited a greater or less amount of lymphoid and connective tissue hypertrophy in the vault. I desire to lay special stress upon the question of the amount of this hypertrophied tissue. In my experience the smallest amount of it is sufficient to furnish a field for the cultivation of infectious material.

We must realize that in adults the process of deterioration of this lymphoid structure can leave but a little of the growth in all but exceptionable cases, but the point we wish to bring out is that even the slightest amount may be the origin of widespread invasion. In the cases of No. 1 and No. 2, there existed the smallest possible amount of hypertrophied

tissue, yet the removal of it brought about good results. In the cases of No. 3 and No. 5, it is our purpose to show the presence of this periadenitis was the determining pathologic process of the chronic suppurative otitis media. The case of No. 4 is of especial interest, showing the effect of bacterial invasion into the right ear during measles in childhood and the development of a chronic progressive deafness in the left ear at the age of twenty-eight.

DIAGNOSIS.

Diagnosis of this disease is a matter of little difficulty. In the routine of all nasal, aural and pharyngeal examinations we carefully inspect the vault in every instance. With the rhinoscopic mirror we can in most cases determine fairly well the condition of the epipharynx; but we should always go farther and introduce the finger behind the soft palate. By this means every evidence of adventitious tissue in this space cannot fail to be discovered. This upholstered mass may exist in considerable thickness without destroying the symmetry of the cavity.

The obtuseness of the angle made at the juncture of the basillar process with the spinal column varies greatly in different skulls, consequently the mirror alone may lead to mistaken idea of the amount, while the keen sensibility of a clean finger is a never-failing indicator.

PROGNOSIS.

The prognosis in these cases is usually favorable so far as the vault condition is concerned. As to the disappearance of complications, this depends upon what organs and functions are involved, the age of the patient, and the amount and character of the impairment. Within the last six years I have operated upon 652 cases of adenoids, both young and old, in my private practice. Of this number 368 were below the age of 25 years and 284 were from 25 to 59 years. Of the 284 adults, 162 were males and 122 were females; 167 between the ages of 25 and 35; 106 between 35 and 45 and 11 between the ages of 45 and 59.

I have seen one case 64 years of age, with large epipharyngeal growth, but was not allowed to operate. Of the 284

adults, 210 suffered from chronic progressive deafness in varying degrees of severity; 24 were victims of recurrent attacks of acute and subacute catarrhal otitis media; 17 had chronic suppurative otitis and 33 exhibited no ear complications of any moment. Of the 210 cases of progressive deafness 182 showed noticeable improvement after operation. This number represents those who faithfully persisted in the after-treatment and whose conditions were not so disastrous as to preclude the possibility of some benefit. Twenty cases were of such long standing and of such a character that the after-treatment failed to bring about any appreciable improvement. These patients gave marked evidence of internal ear complications; the remaining eight cases were operated upon and little or no after-treatment was given.

Of the 24 cases of recurrent acute and subacute otitis operated upon, 16 have had no recurrence of the discharge, and the hearing has been improved; 5 have had recurrent attacks —in 3 of these I have recently done the preliminary stripping and secondary removal, as in the first operation I failed to get rid of the hypertrophies about the orifice of the tubes; 3 cases were operated upon and I have lost sight of them.

Of the 17 cases of chronic suppuration of the middle ear occurring in adults over 25 years of age, five have had no recurrence after the removal of the growth in the vault; eight required subsequent curettage of the necrosed tissue of the middle ear, and four demanded the radical operation. Of the 33 cases operated upon showing no ear complications, all of them exhibited symptoms of nasal and epipharyngeal diseases of various kinds. Four were in-patients who had recurrent hemorrhagic expectoration without evidences of lung complication, and so far have had no return of the trouble. Five cases had active suppurative inflammation in the epipharynx accompanying atrophic rhinitis. Twenty-four were cases of various nasal and pharyngeal conditions where the periadenitis seemed to be the predominant etiologic factor. In more than 75 per cent of these cases turbinal hypertrophies were present. Deflections of the septum existed in the usual proportion. Sinus complications were present in 22—a little less than 10 per cent.

In summing up the question of prognosis, my experience leads me to say that whenever a case presents itself exhibit-

ing any disease whatsoever of the nasal or accessory sinuses, the middle ear, the pharynx or larynx, and at the same time there is evidence of the smallest amount of adventitious tissue in the epipharynx, the prompt removal of this mass adds greatly to the chances of permanent relief. If I may be pardoned for appearing extreme and overzealous, I will go still farther and say that permanent good is practically impossible if this fertile field of infection is not destroyed.

SYMPTOMATOLOGY.

It is hardly necessary to dwell at length upon the symptoms of this disease, as to go into detail would involve the question of complications which are so varied that your patience would cease to be a virtue. Just a few points I desire to bring to your attention. First—The general symptoms are those complained of by patients suffering from the ordinary phases of nasal inflammations, viz., repeated attacks of acute coryza, especially of the infectious influenza type; sensations of fullness in the vault and pharynx and a more or less desire to hawk and expectorate, especially upon arising. Each morning the patient may remove a large mass of inspissated muco-pus; during the day a large amount of mucus and muco-pus is secreted.

As heretofore stated, a very large majority of my cases were coexistent with hypertrophies of the nasal mucosa, and in many deflections of the septum were present. Consequent symptoms of these conditions were present. The same may be said of those showing sinus complications. Secondly—The invaluable aid given us by the mirror, enabling us to see the actual conditions, and lastly, and by all means the most important, information revealed by the introduction of the thoroughly sterile finger behind the soft palate—all conspire to render plain the symptoms of this disease.

TREATMENT.

The treatment of this condition can be nothing less than a total extirpation of the diseased tissue. If allowed to remain it will suffer repeated invasions of acute inflammations and render ultimate relief, even to the remotest complication, impossible.

Situated as it is, high up in the vault and in the fossae on

either side, it has been almost impossible to devise an instrument that will serve the purpose of total extirpation. Failing in so many instances to remove the tissue in the fossae and about the orifices of the tubes, I have resorted to the following method:

Thoroughly cleanse the epipharynx and the nose with a warm sterile normal salt solution by means of the postnasal syringe. Through the nose, by means of long, curved applicators wrapped with cotton, apply an 8 or 10 per cent. solution of cocain several times for ten or fifteen minutes. In the intervals of this application I also apply a solution of suprarenal extract about twice through each nostril. Within this time the vault is well anesthetized. With thoroughly sterile hands the right index finger with long, sharp nail, is introduced behind the palate. Beginning at the lower border of the left eustachian orifice, proceed to break up all the adhesions and upholstered mass within the vault. In other words, strip the growth away from its bed, wherever it can be felt. The result of this preliminary operation is to free the tubes and the fossae of the resisting mass, which is almost impossible to remove by forceps or curette. An active inflammation follows this procedure, which renders the tissue brittle and susceptible of easy separation from the underlying structures. After an interval of forty-eight hours the secondary operation is performed. This is done by the us of the curette in a large proportion of cases. In well-trained throats the Brandagee forceps may serve good purpose. In the selection of the curette I prefer the Beckmann pattern. After the operation the finger should be introduced behind the palate to make sure that none of the growth remains. The size of the curette depends upon the width of the space between the tubal orifices —the No. 4 Beckmann is the size I usually employ. Another important point is that the curette should be pushed high into the vault, following closely the posterior border of the septum, so as to engage the mass. Then changing the grasp of the instrument so that the dorsum of the hand is upward, firmly and quickly with a wrist movement, cut backward and downward, following the under surface of the basillar and the anterior surface of the spinal column. This procedure, if done with a sharp instrument, will deliver the growth into the mouth —sometimes out into the lap of the patient or upon the gown

of the operator. I have performed this operation in this manner more than 200 times and have not had occasion to use a general anesthetic. In fact, I would hesitate a long time before giving ether or chloroform to an adult, first, because the operator is at a great disadvantage by reason of the lying-down position of the patient, and secondly, there is much greater danger of hemorrhage.

The advantages of the primary and secondary operations are: First—The operator can break up all adhesions easily and strip the mass from its bed in the fossae of Rosenmuller, where it exists in greatest abundance. Second—This mass cannot be removed in its entirety in these fossae without the greatest difficulty by the use of forceps or curette. Third—The finger will detect hypertrophies where the mirror will fail to reveal them. Fourth—The danger of severe hemorrhage is practically eliminated by the preliminary stripping of the mass. This procedure breaks up the continuity of the blood vessels, which undergo degeneration within forty-eight hours, at which time the growth is removed. In all of my experience with this method so far have had but three cases of hemorrhage which required plugging.

Case No. 1.—Miss W., aged 28; light eyes, brown hair; applied to me for treatment July 9, 1908. During the winter of 1904 she sufferd an attack of double acute catarrhal otitis media, which lasted some two or three months. Previous to that time had noticed that her hearing was becoming impaired, especially during attacks of "colds." Since the attack of double otitis she realized that she was fast losing ground. Being a music teacher she became greatly alarmed at this condition. Upon testing her ears found watch hearing, right ear 3 inches and left ear 4 inches. During attacks of acute rhinitis hearing in both ears reduced to bare contact of watch. Bone conduction increased; drum membranes of both markedly retracted. Schrapnell's membrane showed signs of previous acute inflammations. Catheterization showed both tubes open and the bougie passed readily into the middle ear.

Examination of nose revaled slight hypertrophies of both turbinals. The epipharynx was the seat of some thickening in and about the orifices of both tubes. The left posterior lip bound down with three bands of adhesions to the posterior border of the fossa of Rosenmuller—only one small adhesion

on right. As represented in the plate, you will observe that there showed but little evidence of thickening except in the two fossae. With the finger I detected great depth to the fossae, which was filled to almost a level of the grooves with a mass of tissue. This mass not observable through the mirror and would have been overlooked but for the use of the finger.

Diagnosis.—Chronic epipharyngeal periadenitis with progressive catarrhal deafness.

During the after-treatment she complained of great discomfort from what she termed her ears "clicking." This symptom has partially disappeared. This "clicking" sensation I regard as an interference with the free action of the tensor tympani, levator and tensor palati muscles, rather than the interrupted entrance and exit of air.

I am reporting this case to illustrate the facts: 1. The mirror alone did not reveal the true condition of the epipharynx. 2. Air passed readily into the middle ear, yet the drum membrane remained constantly retracted. The bougie passed both tubes unobstructed.

CASE No. 2.—Mrs. W. H., age 54; married; one grown daughter. Applied for treatment February 27, 1906. Gave history of progressive deafness of more than thirty years' standing. Right ear the seat of recurrent acute otitis in childhood. Left ear had never been involved in any acute inflammations. Hearing tests: Watch at contact in right ear; at bare contact in left. Bone conduction increased in left; tuning fork on vertex, forehead or teeth intensified in left; indefinite in right. Whisper heard in left at two inches; not at all in right. Drum membrane in right showed many scars and was deeply retracted; ossicles displaced high up in attic and bound by adhesions. Left drum membrane slightly thickened; above firmly retracted; lower portion normal in color.

Examination of the nose revealed turbinal hypertrophies of both inferior bodies. The epipharynx exhibited but a slight ridge on left side extending from the basilar, down the posterior wall blending with some hypertrophied tissue, which began with the upper portion of the fossa of Rosenmuller and disappeared under the posterior eustachian lip of that tube. The right fossa of Rosenmuller was more nearly filled with a mass of larger size—one small adhesion on left side. The finger

confirmed the presence of a mass greater than the mirror showed. This patient complained of much annoyance from the "clicking" sensation in left ear; she complained of very occasional tinnitus.

Diagnosis.—Chronic epipharyngeal periadenitis—fixation of tensor tympani and probable ossicular anchylosis in right ear. Partial fixation of tensor tympani and palati muscles in left ear and vault.

This was a most unpromising case. The patient talked in such low voice as to be almost inaudible. She observed the movement of the lips in those conversing with her very closely.

Prognosis.—Very unfavorable so far as the hearing was concerned. I removed a mass of considerable size from the vault on March 25, 1906. She remained under my charge constantly for more than a year, during which time I catheterized both tubes and introduced bougies twice each week. She persistently complained of the "clicking" in left ear, which even now occasionally troubles her. She called on me May 27, 1909, at which time I found the following conditions: Hearing—Right ear, ½ inch; left ear, 2 inches; whisper test, 6 feet; no tinnitus; hears ordinary conversation at 8 feet distinctly.

CASE No. 3.—Mrs. B., age 34; German parentage; married; one child; light blue eyes, brown hair; strong, robust. Applied to me for treatment November 15, 1905. Had measles at seventeen years of age, followed by a suppurative otitis media in left ear that had never ceased discharging in seventeen years. At the time of my examination found left ear excreting a very foul pus in great quantity. A large perforation, including almost the entire Schrapnell's membrane; the tip of the handle of the malleus was yet intact below the margin of the opening. Incus was destroyed, large granulations protruding through opening. Mastoid had been involved, according to the patient's statement; but no evidence of trouble at the time of her visit to me. Patient heard watch—left ear at bare contact when first examined. Right ear normal.

Examination of nose and epipharynx showed the presence of extensive inflammations. The vault was upholstered with a mass of hypertrophied tissue which under the microscope proved to be an inflammation of the muscular, vascular and lymphoid structures.

This seemed a fit case for radical operation, though I felt warranted in postponing such action until the growth in the vault was removed and the granulations in the ear destroyed. I operated upon her November 20, 1905, removing the growth. Ten days later curetted out the granulations through the perforation in drum membrane; packed the canal with iodoform gauze. This treatment continued for three weeks, after which time the discharge ceased and has not again recurred.

This case with that of No. 5 are exhibited here for the purpose of showing some of the different phases into which this periadenitis enters as determining etiologic factor.

CASE No. 4.—A. J. D., aged 28; single; clerk in dry goods store; dark eyes and hair; not robust; pale and anemic. Applied to me for treatment January 27, 1909, threatened with attack of acute otitis in left ear; severe pains in ear; some temperature, etc. This condition lasted but a few days, then subsided.

Examination of this case showed right ear had been seat of suppurative otitis in childhood following measles; almost total destruction of drum membrane and contents of middle ear. At present only slight discharge. Hearing, right ear, nil. Left ear soon regained its normal condition, so far as any inflammatory process was concerned. The function, however, had been long since impaired. This loss of hearing became noticeable at about eighteen years of age. Following this acute attack, for which he visited me, left ear showed watch at bare contact, which improved to three inches when all acute symptoms subsided. Membrana tympani firmly retracted; some evidence of thickening.

Examination of nose showed prominent inferior turbinals; septal deflection to left side. This patient was operated upon March 29th, after a preliminary stripping done on the 27th. The growth removed was typical of periadenitis and is the last one examined by Dr. Hall, whose report I have submitted to you.

CASE No. 5.—Mrs. G., age 28; light hair, blue eyes; anemic; weight 105 pounds; family history good. At 12 years of age patient suffered an attack of scarlet fever. Right ear became seat of a destructive suppurative otitis media, which continued uninterruptedly for 15 years. Received treatment of various kinds, with no permanent results up to the time of coming to

me. Upon examination of the right ear found hearing completely destroyed; a very offensive discharge of pus, not great in quantity; discharge consisting of pus with much desquamation; epithelial cells becoming inspissated about the walls of external canal. The drum membrane exhibited a large perforation, including the entire posterior superior quadrant; Schrapnell's membrane, the seat of great inflammation, extending high into the attic; the incus had been destroyed, but the malleus and the stapes remained; granulation tissue protruded through the perforation in the drum membrane. During acute attacks some tenderness and swelling appeared over mastoid; but none was present at the time of her visit to me.

Upon examination of her throat I found an inflammatory thickening of the lining of the vault. In the fossa of Rosenmuller on both sides could be seen a considerable mass of hypertrophied tissue, enough to almost obliterate the folds surrounding the tubes, the right mass being much more distinct. Thick adhesive bands extending from the pharyngeal wall to the posterior eustachian lips. The lip of the right tube was very much enlarged; there was little or no hypertrophy in the middle of the vault. The entire surface was covered with a thick mucopurulent secretion and could be seen from the crevices between the folds of hypertrophied tissue. The nasal mucous membrane was greatly thickened, especially over both inferior turbinates and a cartilaginous deflection of the septum to the right side of slight degree.

This seemed to me a very unfavorable case and so informed the patient, telling her that I regarded a radical operation necessary to a complete recovery. To this she demurred. On July 9, 1908, I did the preliminary operation of stripping the vault tissue, and on the 11th removed the mass exhibited to you. This patient made a rapid recovery. The discharge ceased in twenty-one days after the operation, and up to the present time there has been no recurrence.

LVIII.

THE INCISION FOR THE SUBMUCOUS RESECTION.*

By Sidney Yankauer, M. D.,

New York.

The clinical results which have been obtained in the treatment of deflected nasal septa by the submucous removal of all the deviated cartilage and bone, as well as the universal applicability of the operation to all varieties of this condition, have placed this operation upon such a secure footing as the operation of choice, that further discussion of its clinical advisability would be superfluous. But on account of the large variety of pathologic conditions which present themselves, and the consequent varying clinical experience of different operators, a consideration of some of the details of technic may be of some value and interest.

The entire character of the operative procedures, many details of technic, the choice of instruments, and the after-treatment are dependent upon the manner of making the incision in the mucous membrane. From this point of view, two classes of operations may be distinguished—operations through a linear incision, and flap operations.

In Killian's method a curved vertical incision is made in front of the deviation with its convexity forward. The anterior end of the deviation is embraced in the hollow of the curve. When the deviation is very pronounced the lower end of the incision is extended backwards in a horizontal direction along the lowest part of the septum near the floor of the nose, thus converting the operation into a flap operation.

Hajek makes an incision further forward, corresponding to the anterior border of the cartilage, and its removal is begun from this point. As the hyaline cartilage of the septum proper becomes gradually changed into fibrocartilage along this anterior border there is sometimes difficulty in separating the

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mucous membrane at the beginning of the operation. This incision makes it necessary at times to perform the whole operation from the side of the concavity, a decided technical error. It also leaves the tip of the nose supported by a strip of cartilage which has only one attachment to the bony framework of the face, namely, at its connection with the nasal bones. The support of the columna is taken away entirely, and I have seen one case in which a considerable drawing up of the columna took place, resulting in a hook-shaped nose, a very noticeable deformity.

Both the Hajek and Killian incisions are open to the objection that the entire incision is made upon the septum itself; hence it is mechanically impossible to separate the mucous membrane from the cartilage without stretching it. As the mucous membrane is often very thin along the bony crest, this becomes a dangerous procedure. It becomes particularly objectionable after the removal of the cartilage, when access to the bony portions of the septum can only be obtained by forcibly stretching the mucous membrane open with long-bladed specula. These incisions, which have been aptly termed "button-hole cuts," are altogether too small to permit of access to the deeper part of the septum. They are entirely too small to give a sufficient view of the parts when the deviation is complicated by fractures or dehiscences in the cartilage, or by unusual deviation or exostoses of the bony parts.

A better exposure of the septum may be obtained by making a flap of the mucous membrane, the so-called open operations. Two incisions, meeting at an acute or obtuse angle in the form of a V or an L, or three incisions, in the shape of a U, may be made in various directions, so that the resulting flap may be turned upwards, forwards or backwards. Of these the reverse L incision of Freer is the most popular.

While these incisions permit of better access to the deeper parts of the septum than the smaller incisions of Killian and Hajek, they present, in the opinion of the writer, a number of disadvantages. The flap is free in the nose and becomes unmanageable, and is apt to be caught in the forceps and injured, unless it is held back by means of a retractor; this requires the undivided attention of an assistant. As one assistant is always required to sponge the wound, etc., two assistants become necessary. This is a disadvantage, not only in

private practice, but also in clinical practice, where many such operations must be performed; for it delays the clinic and retards other work of equal importance.

One of the incisions which bound the flap is always a horizontal incision. Every incision means a scar, and every scar is covered with squamous epithelium. A horizontal band of squamous epithelium on the septum is a particularly undesirable condition. For the one function of the septum is to afford a large unbroken surface of ciliated epithelium, which by its capillary proximity to the turbinates constitutes the long arm of the nasal syphon, by means of which the entire nose, including the accessory cavities, is drained. A horizontal band of squamous epithelium constitutes a break in the syphonage. The normal secretion of the nose is held up by this form of epithelium, upon which it dries and forms crusts.

Another objection to the flap operations is the increased danger of perforation. Whatever method of making the flap is employed, the incision is so designed as to include, within the area of the flap, the most prominent part, the apex, of the deviation. On the concave side of the septum, the deepest part of the concavity corresponds to the apex of the deviation on the convexity. The mucous membrane of the deep part of the concavity is very thin; it is often so sharply folded upon itself that the bend consists of little more than a layer of epithelium. Moreover, the mucoperiosteum is here closely bound down to the bone; it is continuous with the layer of dense fibrous tissue which lies on top of the bone; sharp serrations from the ends of the bony crest are embedded within it in this situation; its separation, therefore, presents many difficulties, and it is occasionally torn during the necessary manipulations. This possibility is increased by the fact that we are working upon the distant side of the septum, and that it is not infrequently necessary to separate the periosteum over the edge of exostoses which may project prominently into the other nostril. When a tear of any magnitude occurs in the mucous membrane of the concavity, within the area corresponding to the flap, a permanent perforation is sure to result.

These several objections to the flap methods may be overcome by providing sufficient facilities for the work, and by care and skill in operating; on the other hand, a difficulty which is inherent to the method itself is the delayed conva-

lescence. Every plastic flap has a tendency to retract. When the flap retracts, as it does after this operation, an open space is left, which must heal by granulation, followed by epithelialization. An open wound in the nose, exposed as it is to every breath of air which the patient breathes, invariably becomes infected, even though the infection may be, and usually is, of a mild type. Such an infected wound secretes a considerable amount of fluid, which dries and forms crusts. When bone has been exposed and cut, the healing of the wound may be delayed for several weeks, until the slow-forming bone-granulations are built up. In proof of these assertions permit me to quote from a recent article by one of the ablest exponents of the flap operation:

"Up to the tenth day of the operation the patient is directed to keep the naris closed with a pledget placed in the nasal vestibule and changed when it becomes filled with secretion. In this manner dust is excluded and the interior of the nostril kept moist, so that no scabs can form. After this period the patient may use the nostril for breathing, is told to spray it out with normal salt solution and to insert a little plug of wet cotton into it for a few hours at a time, whenever it becomes necessary to soften dried secretion. In addition an ointment is swabbed into the nasal vestibule by the patient to prevent hardened mucus from adhering.

"In most cases it is necessary to continue this cleansing treatment for a period of from four to twelve weeks, for during this time, if the nose be neglected, scabs will form upon the septum."

Now, in Dr. Emil Mayer's clinic at the Mount Sinai Hospital, where most of my operations are performed, such a long period of convalescence from septum operations is quite unknown. Our cases return on the second day for the removal of the packing, and on the fourth day nearly all of the cases can be discharged with the wound healed and the nose free from crusts or secretion. Moreover, in nearly 300 successive cases of deviation of pronounced or extreme degree, there has not been a single perforation resulting from the operation. Nor have such results been limited to the cases operated upon by me personally, for my colleagues at the clinic, as well as others whom I have taught my method of operating, have had similar experience; they may, therefore, be attributed to the

technic employed, which is dependent, as previously stated, upon the method of making the incision in the mucous membrane.

The mucous membrane incision which I have devised for this operation has been previously described as follows: Beginning behind the attachment of the lower lateral cartilage, and about 1 cm. from the dorsum of the nose, the incision is made vertically downwards to the lower border of the nostril, to the point where the mucous membrane of the nasal floor meets the skin of the vestibule. It is then carried outwards along the mucocutaneous junction, half way to the outer nasal wall. This incision permits the mucous membrane of the septum to be reflected upon the outer wall of the nose, that of the inner half of the floor being laid upon the outer half. The opening into the septum is just behind the nostril, and when the tip of the nose is raised, is nearly parallel to it. It is as large as the nostril itself, without stretching the mucous membrane, and any instrumentation that can be done through the nostril can be done through this opening.

When the deviation is not pronounced, the incision is begun several millimeters behind the reflection of mucous membrane which marks the posterior border of the attachment of the lower lateral cartilage to the septum; when the deviation extends far forwards, the incision may be begun at this reflection. When the septum is so twisted that the cartilage of the anterior slope of the deviation crosses the median plane and projects from the other nostril, it will usually be found that the bone of the anterior nasal spine (intermaxillary crest) is correspondingly twisted; the incision is then made along the line of crossing, which always brings the lower part of the incision in the desired place.

As the mucous membrane of the convexity remains anchored to the nasal floor, the flap can be readily controlled from the nostril without the use of deep retractors or long-bladed specula. When it has been properly freed it is ballooned outwards by the act of inspiration, and often sticks to the outer nasal wall through the tenacity of the normal nasal secretions. In the beginning of the operation, until the mucous membrane has been properly separated, it may be necessary to retract the membrane, but this can be done by the operator himself with a spatula or with one of the blunt separators; when the deeper

parts of the septum are reached, the shank of the instrument that is being used serves as a retractor. It thus becomes possible to operate without an assistant, and many of my operations were so performed.

The incision permits of an excellent exposure of the lower anterior corner of the septum and of the angle between this part of the septum and the nasal floor, just underneath the deviation. This part of the septum has not received as much notice in the literature as its importance demands. For, on account of the mobility of the organ in this region, its liability to traumatism, the frequent occurrence of ulcerations, the dislocation of the cartilage from the bony connections, and dehiscences in the cartilage itself, an increased amount of fibrous tissue develops between the cartilage and bone, as well as under the mucous membrane and in the periosteum. This fibrous tissue is very dense and resistant, and has more the nature of cicatricial tissue than of ordinary connective tissue. For these reasons the thorough exposure or opening of the septum in this region is of the utmost importance, especially in difficult cases, in which the uncovering of the anatomical arrangements in this region constitutes the key to the entire situation.

As a result of these considerations we may conclude as follows: A sufficient exposure of the septum to permit of good access to the cartilaginous part of the deviation is essential in all cases, but the incision should be so planned as to permit a sufficient exposure of the bony deflection as well. This is particularly important in extreme and difficult cases, for in these the removal of the bony part is usually indispensable for the correction of the deformity. Just as the anterior portion of the bent cartilage shuts out from view its deeper parts, so the anterior part of the bony deflection, the deviated intermaxillary crest, closes the bend in the bony parts and shuts from view the deeper parts of the deviated vomer. The proper exposure of the bony part of the deviation is, therefore, an essential part of an open operation, and in the experience of the writer can not be obtained by any of the incisions that have heretofore been suggested or practiced so well as by the method herein advocated.

LIX.

AMPUTATION OF THE EPIGLOTTIS IN LARYNGEAL TUBERCULOSIS.

By Lorenzo B. Lockard, M. D.,

Denver.

By far the most fatal, as well as the most painful, localization of tuberculosis in the larynx is the epiglottidean; a type always resistant to treatment, rapid in development and extension, and deplorable in the subjective symptoms evoked.

The picture presented by the unfortunate subject of such a process is well known to all, and no other condition, with the possible exception of a malignant growth, induces a feeling of such utter helplessness as to either cure or effective palliation.

That it is possible, however, through radical extirpation of the involved organ, to effectually relieve the pain in practically all of these cases and to permanently cure the larynx in a small proportion, has, I believe, been conclusively demonstrated.

Extensive studies upon the living and dead have shown that approximately one-third of all consumptives have, in greater or lesser degree, coincident involvement of the throat, and statistics prove that in over twenty per cent of the laryngeal cases the epiglottis is involved. That this estimate is conservative is shown by the following table:

Author.	Cases of laryngeal tuberculosis.	Lesions of epiglottis.
Mackenzie	500	175
Mackenzie	100 (Postmortems)	81
Lake	329	68
Carmody	155	58
Stein	100	65 (Est.)
T. J. Harris	125	35 (Est.)
Author	961	136
	2,270	618—27.22%

In the above table the number of cases of epiglottidean involvement has been compared with the total number having laryngeal tuberculosis. In the following table the number of epiglottidean cases is compared with the total of laryngeal lesions, a method that gives a much smaller percentage, as each individual usually has several distinct foci:

Author	Lesions of the larynx.	Lesions of the epiglottis.
Gaul	140	27
Mackenzie	1,174	186
Lake	859	82
Phipps Institute	150	14
Author	1,671	127
	3,994	436—10.91%

These statistics show that this form of the disease, instead of being a rare manifestation, as is commonly believed, is a relatively frequent complication.

A tuberculous lesion of the epiglottis, while occasionally the sole localization of the disease in the throat, occurs, as a rule, in patients with older and well-developed foci of other segments of the larynx, notably of the arytenoid cartilages and aryteno-epiglottidean folds. Isolated epiglottidean disease, in individuals having pulmonary tuberculosis, has been observed in only a few instances, of which the following may be cited:

Author.	Laryngeal disease limited to epiglottis.
Stein	2
Barwell	1
T. J. Harris	1
H. Bert Ellis	5
Lake	4
Carmody	1
Besold and Gidionsen	8
Author	4
	26

On theoretical grounds the possibility of an epiglottidean focus being the first and only lesion in the body must be admitted, but from a practical standpoint the question scarcely

deserves serious considertaion. B. L. Shurly, in a personal communication, reports one case of apparently primary infection, and one to which considerable doubt attaches is recorded by Lake, the only ones found in a close review of 4,991 cases.

As already shown, epiglottidean tuberculosis is practically always associated with advanced disease of other segments of the larynx and of the lungs, and to this fact, in large measure, can be accredited its appalling mortality, for even if the epiglottidean disease were capable of arrest or cure, the patient would usually succumb to these concurrent processes. Even when the pulmonary and other laryngeal foci are incipient or quiescent, their advancement is rapid after breaking down of the epiglottis, for the severe dysphagia and resultant cachexia soon destroy what little vitality the tissues have retained, and these conditions have generally supervened by the time the case comes under observation.

Even in the incipient cases little is to be anticipated from medicinal treatment, for, as a rule, they progress rapidly from bad to worse, while in those with advanced lesions we are even powerless to control the terrible dysphagia.

From such statistics as are available it would seem that the general mortality of these cases, including both the incipient and advanced, is in the neighborhood of ninety per cent. If one took into account the advanced cases only, those associated with severe dysphagia, it would be found that not more than one to two per cent result in local healing. Many eminent laryngologists place the death rate, in this class of patients, at 100 per cent.

These statistics, moreover, do not show the full extent of our helplessness, for, in addition to the failure to cure or even temporarily arrest the process, we achieve but little in the way of relief; success in conquering or markedly lessening the dysphagia would palliate, in large degree, our lack of success in overcoming the disease.

Any method of treatment, therefore, that offers some hope of local cure in favorable cases, and promise of euthanasia in the incurable, deserves serious consideration, and such a method we unquestionably possess in complete amputation.

Although the number of enduring cures of the patient, as a result of the operation, is small and must ever remain so, because of associated conditions in other organs, the procedure does undoubtedly save an occasional case, and I feel that the

statement is justifiable that no palliative operation, in the whole domain of surgery, gives more brilliant immediate results.

That eventual cures are not more frequently attained is no valid objection to its performance, for the vast majority are already irrevocably doomed when they come under the laryngologist's observation, and we are confronted by a single problem: the relief of pain. In a not inconsiderable proportion of these cases, however, a complete arrest of the laryngeal process is attained, and in a small number the removal of this complication enables the body to conquer the basic disease.

Of the twenty-seven cases operated by the author, twenty-six were completely relieved of pain; in eight the larynx was cured, and in five the pulmonary process eventually became quiescent. Three cases are still under treatment. In one case the palate was also involved, but even in this instance deglutition was greatly facilitated.

Of the cured cases one has endured five years and a half, and one four years and eight months.

When it is recognized that these cases, if operated early, before the vitality is hopelessly impaired and the accompanying conditions advanced to an incurable stage, are susceptible of cure, the operation will take its place as a curative as well as a palliative procedure.

The average length of life after operation, the usual way of estimating the utility of such a procedure, is of absolutely no importance in this connection, for it is no way an index of its effectiveness; the amputation, nine times out of ten, is made with the sole idea of relieving pain, with the knowledge that life cannot be prolonged more than a few months at most; hence statistics are certain to be misleading and disappointing.

Thus Lake, in summarizing his results according to this method, says: "By these methods I have removed the epiglottis some fifteen times. Speaking from this experience, I consider the average duration of life after operation in bad cases, to be not less than three months, and seldom more than nine months; and in a certain number, in which the epiglottis is attacked earlier than usual in the course of the laryngeal and pulmonary disease, a complete cure may result."

Since the results are very favorable when the operation is performed before the concurrent processes are far advanced, a triple classification in tabulating the cases will be attempted.

(a) Results in patients who, were it not for the epiglottidean involvement, might be classed as favorable.

(b) Results in patients suffering from dysphagia due to involvement of the epiglottis, in whom the pulmonary or other laryngeal lesions would warrant an unfavorable prognosis, even if the epiglottis were not affected.

(c) Because of the impossibility of getting definite data regarding the general condition of a large number of cases operated, a separate table, including these cases, must be made.

In cases of the first class a large percentage of enduring cures may be anticipated; in the second class, comprising the great majority, an occasional cure only may be attained, but these would undoubtedly succumb under other methods of treatment, and in those that do not recover the dysphagia will usually completely disappear.

NUMBER OF CASES, 240.

Heryng	100
Barwell	30
Lake	15
Freudenthal	10
Harris	2
Carmody	9
Schmidt	9
Hajek	1
Moeller	20
Beck	1
Gleitsman	3
Flatau	1
Sollenberger	2
Gruenwald	1
Gerber	*3
Sokolowski	*3
Potter	†1
Bennett	1
Newman	1
Author	27
	240

The operation has also been done, a number of times, by Besold and Gidionsen.

*Some additional cases. Number not specified.
†Cancer.

ANALYSIS OF 134 CASES.

CLASS "A."

Cases.	Pain relieved.	Epiglottis healed.	Larynx healed.	Patient cured.
11	11	11	8 3 under treatment.	5 3 no report. 3 under treatment.

CLASS "B."

Cases.	Pain relieved.	Epiglottis healed.	Larynx healed.	Patient cured.
83	79	70	3	0

CLASS "C."

Cases.	Pain relieved.	Epiglottis healed.	Larynx healed.	Patient cured.
40	25	25	8	7

TOTALS.

Cases.	Pain relieved.	Epiglottis healed.	Larynx healed.	Patient cured.
134	115	106	19	12

	Class A.	Class B.	Class C.
Pain relieved	100.00%	95.18%	62.5%
Epiglottis healed	100.00%	84.33%	62.0%
Larynx healed	72.72%	3.61%	20.0%
Patient cured	45.45%	0.00%	17.5%

TOTALS.

Pain relieved.	Epiglottis healed.	Larynx healed.	Patient cured.
85.82%	79.1%	14.17%	8.95%

An additional 100 cases, reported by Heryng in a personal communication, are not included in this report, since general conclusions only were given. He says: "I have operated about 100 times, 70 times with the double curette and perhaps 25 times with the galvanocautery snare. The cautery seemed,

in a number of instances, to provoke severe and prolonged reaction. When possible, I remove either the entire epiglottis, or one-half, with the double curette or cold snare, because after their use there is only the slightest reaction, and the dysphagia disappears more promptly. Evil consequences, such as severe bleeding, I have never experienced."

Of the six other cases not included in the report, five could not be analyzed; the sixth was a case of cancer, involving the epiglottis, in which amputation gave wonderful relief.

In considering these figures, allowance must be made for two sources of error: in the first place, in a small number of cases, after varying periods of complete relief, some pain recurred, owing to progression of complicating laryngeal lesions, and, on the other hand, some cases benefited to a considerable degree were not classed as successful, for I have attemped to tabulate as relieved only those in whom no dysphagia persisted.

Many cases pass from observation after relief of the subjective symptoms, hence the statistics regarding the eventual outcome of the disease in the lungs and larynx are very incomplete.

Of all the authorities consulted, who have performed the operation, only one believes it to be unwarranted: Sokolowski, of Warsaw.

He writes: "Gradually, from year to year, I have departed from the surgical treatment of laryngeal tuberculosis, because by general treatment, combined with local treatment (carbolic, menthol, lactic acid, etc.), I achieve improvement and healing without the bad results of the surgical procedures. For the same reason we have given up complete and partial amputations of the epiglottis, which I previously performed in some cases without any striking results. Recently my long-time assistant, Dr. Erbrich, operated, in our hospital, three cases of advanced laryngeal tuberculosis with severe dysphagia, after ineffectual local treatment, by excision of the epiglottis, but the results were not satisfactory, as the dysphagia was not relieved."

A considerable number opposed the procedure on theoretical grounds, and a yet larger number, who had not done the complete operation, favored, in certain cases of limited involvement, the excision of small areas. As this paper deals only

with the complete operation, their valuable work cannot be quoted.

The general opinion of those who have had considerable experience with the operation is well reflected by Jorgen Moeller, of Copenhagen, who wrote to me as follows: "As you see, I have this time (10 unreported cases) no brilliant results to record. The cases, however, were all very bad, and in which the indications for operation, as previously adhered to, were extended to embrace all cases of severe dysphagia due to the epiglottis, even when the lungs were hopelessly diseased. (In his previous ten cases, in which the line was more strictly drawn, he had three cures: two of these are still well, and one has had a recurrence.) It appears to me, however, that the history of these cases supports the correctness of this extension of the indications for amputation, because almost without exception there was wonderful relief that lasted for a longer or shorter time, frequently until death."

INDICATIONS.

There need be no confusion regarding the types of cases in which amputation is indicated.

1. The operation is imperatively demanded in every case of involvement accompanied by severe dysphagia, regardless of the state of the lungs.
2. Immediate removal is indicated even when dysphagia has not supervened, provided the lesion is extensive and there is still hope of arresting the pulmonic disease. The existence of such a focus is a constant menace, because it may at any moment give rise to severe pain and in a brief period cause irreparable injury.
3. Any lesion that resists treatment should be excised.
4. If the condition of the epiglottis is such as to hinder correct treatment of underlying lesions, it may be removed to render these parts more accessible.

METHODS OF AMPUTATION.

The methods employed are unimportant, provided they permit of complete excision and leave a smooth stump. If the lesions are sharply circumscribed, only the affected parts need be removed, but when there is considerable involvement, or if

doubt exists as to the true limits of the disease, the entire organ should be amputated.

The preference of the individual may decide in favor of the cutting forceps, the cold snare, or the electric snare.

In my earlier cases I used the galvanocautery snare, but early abandoned it, owing to the severe reaction experienced in nearly every instance. In one of my last cases I used the cold wire, as advocated by Gerber, of Koenigsberg, who has operated three times in this way. In its favor he claims (1) slight reaction in the neighboring tissues, (2) slight pain and little bleeding, (3) rapid performance.

In my case the first two indications were fulfilled, but owing to a slight slipping of the loop it was necessary to remove the central base with the forceps.

Gerber says: "I have frequently removed the epiglottis, formerly with the cutting forceps and cautery. Of late, however, with especially good results, by means of the cold snare. I have undertaken this for the relief of severe dysphagia, and have had very good results.

"An influence upon the general disease in cases of extensive tuberculosis has not been experienced or expected."

With perfect adaptation of the snare much time may be saved, as it is rarely possible, with the cutting instruments, to thoroughly remove the organ with less than three distinct sections—one for the central portion and one each for the lateral thirds.

Of the cutting forceps there are two of almost equal utility; the Lake-Barwell and the Spiess. The great fault with the Spiess instrument, as commonly made, is that it has the same length of shaft and curve as the instruments designed for endolaryngeal work, so that, in many instances, when the cutting blades are in position, the shaft impinges against the palate to such an extent that free manipulation is impossible. In one instance, when no other instrument was available, nearly three hours were consumed in the operation, as the irritation produced in the attempts to introduce the instrument caused uncontrollable gagging. With the correction of this defect it would be a very valuable instrument. In the Lake-Barwell forceps this fault does not exist. The operation is likewise simplified by the possession of several instruments of various sizes, with the blades placed at different angles to the shaft, for in no two instances is the epiglottis of the same size and shape.

In several instances I have successfully used a modified lingual tonsillotome.

The parts can be so completely anesthetized with 20 per cent cocain as to make the operation practically painless; never have I seen even the most sensitive and nervous patient rebel.

Hemorrhage is seldom severe and it is not necessary to make preliminary applications of adrenalin; after each section there is free bleeding for a few seconds, necessitating a brief period of waiting before the following cut can be made. In only one case, of which I have record, has the bleeding been even profuse; this occurred in the practice of Harold Barwell, but no especial procedures were necessary for its control.

The report of an interesting case of hemorrhage was sent me by Moeller, of Copenhagen. He writes: "Immediately (after the amputation) severe bleeding occurred, which, despite the local use of ice, persisted, unabated, for an hour, when I was able to get a good view of the larynx, and found the wound covered with a firm coagulum and no bleeding point; the patient also declared that his sensations were the same as during a previous pulmonary hemorrhage. He was, therefore, sent to the hospital. After six weeks he was discharged feeling very good; there was, however, no demonstrable improvement of the pulmonary process. The amputation wound was almost completely cicatrized; the disease in the interior of the larynx needs further treatment."

In nearly all of my cases the organ was removed as near as possible to the base, but never was there any bleeding of moment. The last vestige of blood in the sputum has usually disappeared within a quarter of an hour.

In its exposed condition, subject to constant insult by the pulmonary secretions, it would seem probable that postoperative infection would be a danger of considerable magnitude, but this contingency has only rarely materialized. Lake reports one case of infection of the stump that responded to treatment, and I have seen two cases in which superficial ulceration occurred; in both instances the ulcers disappeared under the use of antiseptic sprays and cauterizing pigments. In one case the stump became infiltrated, but did not produce any particular discomfort. In several additional cases, in which the dysphagia was completely relieved, the stump was not entirely healed at the time of death, but including these, it leaves, in my series,

twenty-three cases of perfect healing in a total of twenty-seven.

Barwell, in thirty amputations, has not met with one where there was postoperative ulceration or inflammation; Gleitsmann has removed the organ three times without subsequent local infection; T. J. Harris did not have it in either of his two cases, and Dr. Carmody, of nine cases which he operated, had two in which the wound was not completely cicatrized at the time of death; in the remaining seven local healing was perfect.

Aggravation of the pulmonary process must be an accident of extreme rarity. Barwell, in a personal communication, says: "In nearly all of my cases the excision has been performed merely for the relief of dysphagia, for in my experience infiltration of the epiglottis seldom occurs until the disease in the lungs and other parts of the larynx is so far advanced that cure is out of the question. I have never seen any shock; hemorrhage has never been dangerous, and only profuse in one case. I have never found the general condition made worse by the operation. The wound never becomes inflamed nor acts as the starting point of ulceration; in most cases where the general condition is fairly good it tends to heal rapidly and often becomes completely healed in about fourteen days. In every case the severe dysphagia has been much improved and frequently quite abolished, but in some removal of the arytenoid swelling has become necessary as well."

Dr. Freudenthal, in summarizing the results of his ten operations, says: "A reinfection was stirred up that caused death in some cases within a week."

In one of my cases, a man of twenty-three years, there occurred, ten days after operation, a miliary outbreak in the pharynx and nasopharynx that soon produced wide destruction of tissue. The patient had large cavities in both lungs, universal laryngeal involvement, and a large tuberculous ulcer of the right cheek, above and posterior to the last molar, forming a necrotic pouch as large as a hickory nut. At the time of operation this ulcer was extending to the anterior pillar, and the temperature was ranging around 103 degrees. Two weeks before the epiglottis was removed he was operated for appendicitis. The miliary outbreak could hardly be accredited to the operation, which was performed because deglutition had

become impossible and he was starving to death. The pain was greatly lessened by the operation and thereafter could be largely controlled by cocain and morphin.

In very exceptional cases the cough is temporarily aggravated and the sputum increased, but these symptoms rapidly subside. In the great majority of instances the exact opposite obtains, and the cough is almost at once diminished in frequency and severity, sometimes to an extent that seems almost incredible. Occasionally the temperature is slightly elevated for one or two days, but usually there is a decided and almost immediate fall from the average maintained during the preceding weeks, the declension, in several cases, amounting to three and four degrees within the first few days.

AFTER-TREATMENT.

Because of theoretical considerations it was long the author's practice to have the patients fed by nutrient enemata during the first week; today he permits the taking of non-irritant liquid food within a few hours of the time of operation. As a rule little pain is experienced, but as paroxysms of coughing are occasionally, though rarely, provoked, it is advisable that solid food be withheld for a couple of days. In a number of instances a full meal has been eaten at the end of forty-eight hours. If difficulty in swallowing is experienced within the first days the food should be taken through a tube, while the patient lies prone with the head well below the level of the body. In the short interval during which solid foods are withheld the strength is maintained by raw eggs in milk, custards, beef-juice, Biftick a la Tartare, raw oysters, gelatines, etc.

During the first twenty-four or thirty-six hours comfort is promoted by keeping the air of the room impregnated with steam, and there is nothing more soothing than the following mixture, one teaspoonful to the pint of boiling water:

Ol. pinus pumilionus	dram i.
Menthol	gr. xxv.
Milk of magnesia	oz. ij.

Until healing is complete the cough is controlled, if excessive and irritating, by sedatives and expectorants; the larynx is cleansed several times a day by a one-half per cent formalin solution, followed by a daily application of 20 per cent argyrol,

and if pain persists, the injection of orthoform emulsion, according to the formula of Freudenthal.

Immediately after the operation, as soon as bleeding has stopped, the stump is thoroughly rubbed with lactic acid. Heryng advises the use, at this time, of a two per cent alcoholic solution of malachite green.

To one who has not previously performed this operation two things are a decided revelation; the wonderful and almost immediate relief of pain and the insignificant amount of post-operative inflammation and discomfort, unless there are accompanying conditions themselves provocative of pain. Even in these cases the suffering is greatly diminished. One naturally presupposes a prolonged period of odynophagia and dysphagia, but in practice it is found that the odynophagia almost immediately disappears, that there is little subsequent soreness, and that deglutition, previously difficult or entirely impossible, becomes at once almost normal.

I believe it can justly be claimed that by this operation we save a certain number of lives that otherwise would most certainly be sacrificed; that in the vast majority, when a cure is not to be thought of, we effectually conquer the pain, and that we succeed, even in those in whom the suffering is not entirely controlled, owing to the presence of complicating lesions, in diminishing it to a notable degree.

LX.

A NEW METHOD FOR INFLATING THE EUSTACHIAN TUBE AND MIDDLE EAR.*

By Edmund Prince Fowler, M. D.,

New York.

For forty-five years Politzer's method of inflating the middle ear has had no rival for simplicity and but few for efficiency and safety. The reason for its pre-eminence in otologic practice is that it makes use of the act of swallowing to open the pharyngeal mouth of the Eustachian tube, and this is the method by which nature mainly and best maintains the normal pneumatic balance in the air channels of the middle ear. Politzer's method is, however, sometimes impotent to effect an entrance into the closed tube, and we are driven to modifications or other methods of inflation.

Although you are all fully cognizant of these modifications of Politzerization, I will briefly state the most important.

Instead of swallowing water at the moment of air compression in the nasopharynx, the simple act of swallowing may be performed, or a lump of sugar or other substance may be held in the mouth to increase the secretion of saliva and so facilitate deglutition. Simply lifting the soft palate will occasionally open the mouth of the tube; so also acts phonation, especially of words containing the syllables "hic," "hac" and "huk," etc., and the letter "k." Blowing into and puffing out of the cheeks, or inspiring through the nearly closed lips, or through a small tube inserted between the lips, all tend to elevate the palate and shut off the nasopharynx from the aural cavity, and so enable the air pressure to be increased in the former during the air insufflation. Whereas at times one of these methods may succeed in aiding Politzerization, it is rare to have it so happen, and we are usually forced to catheterize

*Read before the Section on Otology, New York Academy of Medicine, January 8, 1909.

the tube to obtain the desired increase in the intratympanic pressure in different cases.

In children, we are frequently dependent on their cries for closure of the soft palate, and in adults and children it is not an uncommon occurrence to fail miserably, because we cannot with sufficient accuracy time the air-bag pressure so that it will coincide with the shutting off of the patient's nasopharynx.

Stenosis of the pharyngeal orifice of the Eustachian tube from edema or tenacious mucus frequntly blocks the entrance of air by Politzer's method, and even cleansing or shrinking the tissues with adrenalin or cocain fails to permit entrance of the air. Likewise, narrowing or closing of any portion of the tube will often effectually block all attempts at inflation.

Now, although we have in catheterization of the tube a most efficient and dependable means for inflation of the middle ear, there are many reasons why we should prefer Politzerization, if the latter is feasible. Briefly, these reasons are—its simplicity of application, which enables not only the general practitioner to successfully treat many ear affections, but also adapts it for use by the patient himself; its possibility of use in many cases in children and adults where catheterization is impossible because of deformities or pathologic conditions in the nose or nasopharynx, or because of the pain, discomfort or irritation caused by the introduction of the catheter into the nose or tubal mouth.

I will not go more fully into the advantages and disadvantages or dangers of Politzerization and catheterization in this paper, as they are well known to all otologists, and space will not permit. I have briefly summarized the matter as above, to better lead up to the consideration of the method with which I desire to acquaint you, as it was partly through the contemplation of facts such as I have noted that I was led to devise it.

During the experiments incident to the testing of my instrument for diagnosing and differentiating ossicular anchyloses, I was struck with the fact that after Valsalva's experiment, or inflation of the middle ear by other means, the normal pressure in the tympanic cavity was reestablished with much more facility on swallowing than was the case after swallowing following Toynbee's experiments or deflations by other methods. It was clearly apparent that the Eustachian tube would permit of air transit towards its pharyngeal end with more

facility than in the opposite direction. It was also to my mind quite clear why this should be the case, aside from the action of the cilia, or the form or patency of the Eustachian tube. I reasoned that although the tube could not be exactly compared to a soft tube outside of the body, its membranous portion, and especially the pharyngeal end, could be so thought of, and that a partial vacuum or condensation of the air, distal to its pharyngeal mouth, would act similarly to a partial vacuum or a condensation of air distal to a closed section of very soft rubber tubing. In both cases it needs no elaborate argument to prove that a diminished air pressure distal to the stricture would tend to hold in approximation the stenosed segment, or that an increased pressure would tend to make it more readily patent.

These results would likewise hold in kind, if pressure was brought to bear from the proximal ends of the tubes, and they would open much more readily under this air pressure if the air contained in the distal portions was in a state of condensation than if it was below normal atmospheric pressure. These facts throw light on the subject of Eustachian tube permeability, and the vicious condition which tends to perpetuate itself once the normal air pressure in the tympanic cavity is lowered by tubal strictures. They also suggested to me a method of effecting the permeability of the Eustachian tube, of relieving conditions of diminished air pressure within the middle ear, and of treating middle ear diseases concomitant with these lowered tensions.

The method consists of bringing an increased air pressure to bear on both extremities of the closed portion of the tubal lining by simultaneously condensing the air in the middle ear and in the nose and nasopharynx. To accomplish this end we may construct apparatus in several ways, and I will describe two.

The simplest form consists of an air bag connected by means of a Y tube to a nose-piece and an ear-piece. The former is preferably a large, olive-shaped nozzle, and the latter one of my ear massage cups—as both of these devices are more agreeable to the patient, easy of application, painless, sufficiently tight, and cleanly. I regularly substitute a magnifying Siegle's speculum for the ear cup, during the first few inflations, and obtain a magnified view of the tympanic membrane, to be sure that the air has entered the tube, as many people cannot recog-

nize its entrance, owing to the meatal air compression preventing the drum from violently distending, as is the case in Politzerization. The patient holds the nose-piece with one hand tightly in either nostril, and closes the other nostril with the fingers of the same hand. The surgeon adjusts the ear-piece tightly into or about the ear, depending upon which contrivance he is using, and holds the air bag with his right hand. The patient is told to swallow, and as he does so the surgeon quickly compresses the air bag, thus bringing to bear on the tympanic membrane, middle ear contents and outer extremity of the Eustachian tube, an increased air pressure, and simultaneously an increased nasopharyngeal pressure on account of the closure of the soft palate, and if the act of swallowing has opened the tubal mouth the air pressure extends through the tube toward the middle ear.

If for any reason the pharynx was not properly shut off from the nose, the force of the air expends itself against the posterior pharyngeal wall, and in the nose and oral cavity, and a slight wave reaches the ear drum through the branch going to the ear-piece. This latter cannot be of much consequence unless the air pressure in the tubing is increased by the closure of the nares and soft palate.

If it is desired to bring suction to bear on the nose and middle ear, it is necessary to at once release the air bag after the inflation, keeping the apparatus in place and the nostrils tightly closed. In stenosed or blocked tubes suction does not often act through the pharyngeal mouth of the tube, as the moment it is exerted the inner portion of the tube collapses and the suction affects the tympanic cavity only through the partial vacuum in the external meatus.

In cases with patent tubes it is often possible to bring alternately suction and compression to bear on both sides of the drum if the tubes are maintained open by elevating the palate by forced inspiration or expiration through the lips.

The above described method is sometimes annoying, for the same reason as is Politzerization, namely, failure to correctly time the compression.

To obviate this difficulty and to more perfectly regulate the amount of pressure exerted, and to almost wholly eliminate any pressure on the external surface of the drum membrane, except there be a successful condensation of air in the nose and nasopharynx, I constructed the following apparatus:

The tube from the ear-piece is joined to the nose-piece, or enters the latter's tubing very close to the nose nozzle. The tube to the air bag is constricted just before it gives off the branches to the nose and ear, and an elastic reservoir bag is placed between this constricted portion and the air compression bag. The latter is provided with a valve, as in double bulb atomizers, so that although the supply of air to the second bulb is intermittent, the latter through its elasticity maintains a continuous current of air through the distal constricted portion

Aural Inflater.

of the tubing. This constricted portion must be of such a lumen as to retard the escape of air sufficiently to permit of its accumulation in the storage bulb.

By the above arrangement we are relieved from the necessity of noting the exact instant of our patient's swallowing, for no matter when he accomplishes the act, or in other ways opens his Eustachian tubes and closes his nasopharynx, the air from the apparatus is pouring into his nose and will increase the pressure in the nasopharynx the instant its escape into the oral cavity is cut off. Moreover, at this instant and not before,

the pressure in the ear portion will be increased by the same means which bring about an increased air pressure in the nasal cavity.

By continuing to supply air to the reservoir bag as long as it is desired to continue the treatment, and every time the patient swallows or in other ways opens his tubes and approximates his soft palate to the posterior pharyngeal wall, so often will we accomplish an inflation of the Eustachian tube.

If it is undesirable to inflate both ears, one may be closed with a moistened finger to prevent its tympanic membrane from bulging during the treatment, but I find that this is seldom necessary, for as a rule the ear under treatment alone is inflated. Two ear cups are used if double inflation is desired.

After a little practice one can demonstrate on himself and learn that the ear under simultaneous compression requires less pressure to open its tube than does its fellow.

The possibilities of simplifying tubal inflation by this method are numerous; for instance, we can substitute for the hand bag a foot pump, or a compressed air reservoir, or the electric air pump, and easily arrange that just so much pressure is exerted during the treatment.

The indications and contraindications for using the method are not as yet fully worked out, but I believe it is indicated in preference to Politzerization or catheterization in many cases, especially in children; if the drum ear is atrophic; during tubal or middle-ear congestions or inflammations; in the after-treatment of suppurative otitis.

Unless the drum membrane is movable or permeable the method is not applicable.

To prove its usefulness, I hope some of you will give the method a trial, and report pro or con at some future meeting of the Section.

LXI.

A SIMPLE ACUMETRIC FORMULA ADOPTED BY THE EIGHTH INTERNATIONAL OTOLOGIC CONGRESS AT BUDAPEST, 1909.*

By Jörgen Möller, M. D.,

Copenhagen.

For many years otologists have felt the need of a simple method of indicating the results of the functional tests for hearing. Nearly everybody who tests the hearing has his individual formula, which fails more or less to be understood by his colleagues, especially those from other countries, unless it is explained anew in every publication. If the acoustic functional tests were everywhere made in the same way it would indeed be most acceptable. This, however, is not the case, nor is it necessary. What can be done, however, and what should be done, is that the chief tests ,which are everywhere used, should be noted in the same way and with the same international signs, so that everybody may know at once what they mean.

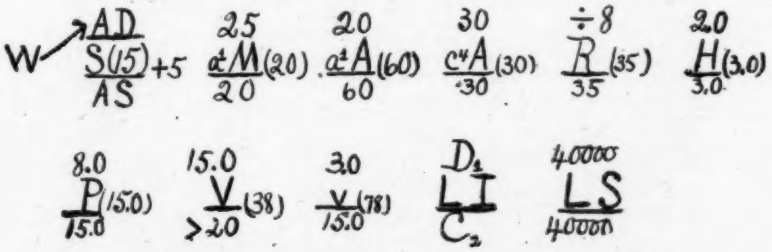
As early as the Congress at Bordeaux the question of a simple acumetric formula was discussed, and Drs. Politzer, Gradenigo and Delsaux proposed a formula which was practical and easily understood. However, the subject was given over to an international commission by the Congress for further study. The majority of the members of this commission agreed upon a proposition, which was laid before the recent VIII Otological Congress, held at Budapest, and which was accepted by it. The formula agrees in its main points with the Bordeaux formula, but has been modified in many points. The commission has considered only the so-called qualitative functional tests, while the quantitative tests, testing of the hearing, etc., was left to each one's taste. Moreover, the commission did not desire to establish a collection of tests which

*Translated by Clarence Loeb, M. D.

should be exclusively and invariably used. They desired, rather, to make the formula so comprehensive that each man could find therein just what he needed, and could omit whatever seemed to him superfluous. However, the commission thought that a certain number of tests were necessary if it was desired to carry out a functional test which would be exact and of diagnostic value. Above all, however, the commission was intent upon devising an international notation, a system of abbreviations, which would be understood everywhere, no matter in what language the author wrote.

PROPOSAL OF THE COMMISSION.

In order to be able to write down the results of the functional tests in a manner as simple as possible and one understood by everybody, it is necessary that the fundamental formula established by the commission be used and that, furthermore, if abbreviations are employed only those established by the commission should be used. The abbreviations of each test are the initials of a corresponding Latin name, but the pitch is always designated according to the German musical method. The formula adopted by the commission has the following appearance (in order to assist its understanding the figures of an imaginary functional test are given, such as might be found in a right-sided middle ear affection):



A. D. and A. S. mean *Auris Dextra* and *Auris Sinistra.*

W means *Weber's* test. The lateralization is shown by an arrow pointing in the proper direction. If there is no lateralization after the W an = sign is placed. If the tuning fork is not heard by bone conduction a 0 is placed. Tuning fork a^1 (435 v. d.) is used. S means *Schwabach's* test. The difference in time from the normal perception time is indicated

with a + or a ÷ and the number of seconds. Or by an = when the perception time is normal. The same tuning fork is used. The normal perception time of the tuning fork must be added.

a^1M means the perception time of the tuning fork a^1 (435 v. d.) upon the mastoid process (M = mastoideus, bone conduction). The normal perception time is added in parenthesis, the perception time for the right or left ear of the patient above and below, all indicated in seconds. In case only the difference in time is measured this is noted with a + and a ÷, or in a superficial examination without adding the number of seconds, simply +, i. e., lengthened, or ÷, i. e., shortened, are used. Normal perception by the patient in the latter case is indicated by =. The normal perception time of the tuning fork must be added in such cases where only the difference in time is measured. Instead of a^1, another tuning fork, for example, c^2, can be used.

a^1A means the perception time of tuning fork a^1 (435 v. d), held directiy in front of the meatal opening (A = aer, air conduction). Otherwise the symbols are the same as in the bone conduction). c^4A means the perception time of tuning fork c^4 (2048 v. d.), held directly in front of the meatal opening.

R means *Rinne's* test, and measures the difference in time between air conduction and bone conduction, or between bone conduction and air conduction, and the number of seconds are added, accompanied by a + if the air conduction is greater, and by a ÷ if the bone conduction. If the perception time for air and bone conduction is the same, an = is placed. In superficial examinations, the simple + or ÷ may be used without addition of the number of seconds. If the fork is heard only by air conduction, this is shown by a +t; if it is heard only by bone conduction a ÷ ; while the difference is shown by t ÷ , t meaning air conduction and v bone conduction. If in the Rinne's test the difference time is estimated, the normal difference time for the fork must be given in parenthesis. Tuning fork a^1 (435 v. d.) is used.

H means *Horologium,* watch. The normal distance for meters is shown in parenthesis, the hearing for the right and left ear of the patient above and below. In case the watch is heard only in contact with the auricle a. c. = ad concham is written.

P means the *acumeter* of *Politzer*. The hearing distance is written in meters similar to the watch.

V means *Vox* (voice), and indicates the ordinary conversation tone; v means *whisper*. The hearing distance is given in meters and the word used in testing is added in parenthesis. If all the words used in testing are heard in the greatest distance at the physician's command, so that it could be supposed that at least some words might be heard at a greater distance, a > is added. If the voice is understood only very close to the ear, 0.01, i. e., 1 cm., is written. If the test is made with equiintensor and isozonal words, according to Quix, the values for the different groups are joined by brackets, with the value for the deepest group first.

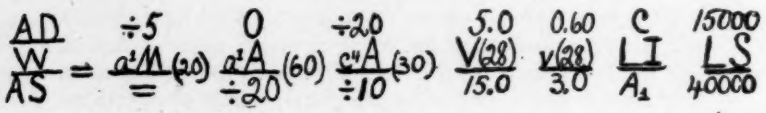
LI, *Limes inferior*, means the lower limit. When possible, it is always estimated by the series of tuning forks of Bezold, and the lowest tone heard is put down with its musical name or the number of vibrations of the corresponding pitch. If the examiner has not such a series, but must use a series of C forks of the different octavos, a < is added to the symbol of the deepest fork still heard, to show that in this case possibly a still deeper tone could be heard. It must be noted what series was used.

LS means *Limes superior*, upper border. If this is estimated with Edelmann-Galton's whistle, the vibrations of the corresponding pitch are given. Otherwise, the pitch and the corresponding source of the pitch, Schulze's monochord, König's rods, etc., must be added in the text accompanying the test. The highest tone heard must always be given as the limiting value.

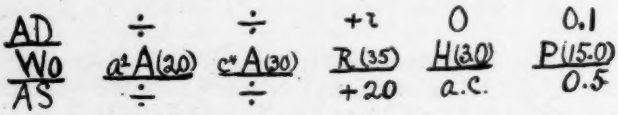
Under certain circumstances, certain examinations can be omitted, such as the watch and Politzer's acumeter; furthermore, Schwabach and Rinne may be omitted if bone or air conduction alone are tested, as, on the other hand, bone and air conduction may be omitted when Schwabach and Rinne are under investigation. In case any tuning fork is used, except the one designated, it must be described exactly. If other tuning forks are used than those indicated in the formula, the symbols of these, as well as their time of perception, may be used after the chief formula. Gelle's test, etc., must be added with their complete designation. If the quantitative test is made, it, as well as its graphic representation, must be exactly

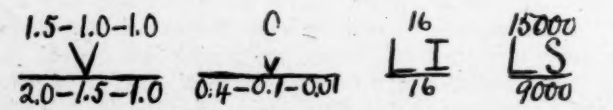
explained. The pitch of the tuning forks and other sources of sound are designated in the following way:

The notes are c, d, e, f, g, a, h. The intervening notes are designated in the manner usually employed in the German musical notation, by addition of s or es to the symbol of the note to indicate a lowering of a half tone (e. g., des, es, as), and the raising of a half tone by addition of is (e. g., fis, gis, ais). The octave is shown in the following manner: C_2, C_1, C, c, c^1, c^2, c^3, c^4, c^5, a C indicating 16, 32, 64, 128, etc., vibrations. The vibrations of the tuning fork are always given in double vibrations (v. d.). As an example a couple of imaginary tests will be given.



This reads: Tuning fork on the skull not lateralized. Right ear: bone conduction shortened, air conduction for a^1 gone, for c^4 shortened. Aural acuity for conversation and whisper, test word 28, considerably diminished, lower limit decidedly raised, upper limit somewhat contracted. Left ear: bone conduction shortened, aural acuity for conversation and whisper somewhat lessened, lower limit somewhat raised, upper limit normal. Diagnosis: combined middle ear and labyrinth on the right side, simple middle ear trouble on the left side.





This reads: Tuning fork on the skull not heard. Air conduction on both sides shortened, Rinne positive, the tuning fork not heard from the right mastoid process, watch on the right side not heard at all, on the left side only in contact. Politzer's acumeter heard on the right side 10 cm. away, left

side 50 cm. away. Conversation tested according to Quix with three groups of words, heard only very close, those of high tone, which normally are heard much further than those of deep tone. Whisper not heard at all on the right side, on the left side only very close, high tones heard only when spoken directly into the ear. Lower limit normal (16 v. d. = C_2); upper limit decidedly low. Diagnosis bilateral labyrinth affection.

This resolution of the committee was accepted by the representative of Denmark (Möller), Germany (Panse), Holland (Quix), Italy (Gradenigo), Austria (Politzer), Switzerland (Siebenman). The commission requests that every reader of this exert himself among his colleagues to the end that the above rules be used in every test for hearing.

LXII.

A PLASTIC MASTOID OPERATION—A NEW OPERATION FOR ACUTE MASTOIDITIS.*

By Frank T. Hopkins, M. D.,

New York.

Although the technic for the mastoid operation for acute mastoiditis is generally well understood and satisfactorily done, we have, as yet, accomplished little in shortening the length of time required for the after-treatment, which remains still a labor of many weeks' duration. In recent years, however, two methods have been proposed with this end in view: (1) the blood-clot method,[1 2 3] and (2) the so-called modified blood-clot method. In the blood-clot method the posterior wound (the skin incision) is closed absolutely, and the bone cavity is supposed to fill up with a blood clot which shall later become organized. In the modified method there is no blood clot at all. The wound is sutured throughout, with the exception of a small opening at its most dependent portion, through which the drainage of the cavity is secured. The granulations are left to take care of themslves, and the drain is removed when the granulations have sufficiently filled the cavity to make the introduction of the drain difficult.

While in some cases both of these methods have given brilliant results, yet in other cases very serious accidents have followed—due to the loose piling up of granulations and the burrowing of pus through easily formed fistulous tracts. The surgeon has no control over the granulating process, and no knowledge of the burrowing of pus, until some abscess, more or less deeply placed, produces unfortunate results.

In this connection we may mention Plummer's[4] method which, with the modified blood clot as a basis, endeavors to fill up the greater part of the bony cavity by bodily pushing back

*Read before the Section on Otology, New York Academy of Medicine, January 8, 1909.

the posterior wall of the membranous canal, having lowered the bony wall to do this, and holding this membranous wall in approximation to the bony surface by firmly packing the canal. The posterior wound is then partially sutured and drained. Here the same objection obtains as in the former method—that of an uncontrolled granulating process in a closed cavity.

In 1877 Wolf[5] suggested making an opening for drainage through the posterior canal wall, after removing the bony wall to do this, and then closing the initial incision throughout except at its lower angle, which was to be left open, thus affording opportunity for thorough irrigation of the bone cavity. I do not know whether the later methods are based on Wolf's suggestion or not, but his method did not, at that time, meet with much favor; and for acute mastoiditis no essential change in after-treatment was made until the blood-clot method was proposed.

The method which I am about to describe, and which I have called a plastic mastoid operation, consists, in a word, of: first, making a meatal opening through the concha and posterior canal wall; secondly, the complete closure of the posterior, or initial, incision; and finally, the cicatrization of the excavated mastoid surface; in other words, the application to acute cases of the plastic methods now used only in radical operations. In the details of the operation my method follows along the lines of the Heath operation for chronic purulent otitis media, which Heath[6] proposed in 1906, and which, with more elaborate technic, was described by Ballenger[7] in 1908, but which has not been used by either of these surgeons for cases of acute mastoiditis. My method is simple and free from danger, and the time required for postoperative treatment is much shorter than by the present method of filling the bone cavity with granulations.

In the method I propose the usual mastoid operation is done, and with the same care and attention to detail. When in all other respects the mastoid operation is complete, the outer portion of the posterior bony wall of the cavity is cut away about the level of the floor of the canal, so that it shall offer no hindrance to free drainage. This removal extends as far inwards as the outer wall of the antrum, but the outer wall of the antrum, unless necrotic, should be left intact. An opening is then made in the concha and posterior fibrocartilaginous

wall of the meatus, exactly as is done in the radical operation; but in doing this the precaution must be observed that no traction be made on the membranous canal which shall disturb the position of the membrana tympani. The style of the incision—the shape of the meatal flap, is unimportant; either a Ballance incision, curved and tongue-shaped, or a Panse incision, T-shaped, and giving two quadrilateral flaps, may be chosen; the object being to furnish a window of sufficient size to give drainage and make the excavated mastoid surface accessible through the meatus. The cartilage included in the flaps must be dissected out, the flaps turned back to line the mastoid cavity,—the raw surface against the raw posterior surface of this canal wall,—and should be secured in this position by cat-gut sutures. These sutures must be passed through the periosteum or through an aponeurosis of muscle, but not through muscle tissue, or they will be apt to pull out and permit the flap to sag, which will eventually leave the opening inconveniently small. When the flaps have been secured the cavity is packed with a strip of iodoform gauze, and the end of the gauze brought out through the meatus. The posterior wound is sutured throughout with silk-worm gut, and the usual dressings applied. At the end of five days the dressings are removed, the stitches of the initial incision are taken out, and this wound should be found healed throughout by first intention. The packing is carefully removed through the meatal opening, and the cavity, after cleansing by irrigation and by swabbing, is again somewhat lightly packed. For a day or two longer a light protective dressing may be applied behind the ear.

In considering this mastoid excavation and the healing of it, we must disabuse our minds of any idea of a cavity to be filled up with granulations. This is not the case. Rather, it is a surface which, having granulated, is to be covered with cicatricial tissue, and so must be treated as the similar surface of the radical operation, though it may be a little more extensive in its area, since it dips downward into the region previously occupied by the mastoid tip.

The subsequent treatment consists of applications through the meatus, which should be made daily. If granulations are exuberant, the curette or silver bead. When cicatrization has begun there should be no packing, and usually swabbing is better than syringing. Most important is the careful attention

to exuberant granulations, especially in the posteroinferior angle, where they often escape notice and become very troublesome. Cicatrization will soon be found spreading up over the antrum and along the vault of the cavity. The whole surface may be expected to be dry in five or six weeks.

To lessen even this short period of the time required for healing we may have recourse to skin grafting. At the end of two weeks a firm and satisfactory granulating surface will give opportunity for a graft to take. This may be applied through the meatus and, if successful, will materially shorten the time of cicatrization; or the posterior wound may be reopened and a Thiersch graft inserted, and the wound sutured again, as in secondary grafting in radical cases.

In case the skin is inflamed at the time of the primary operation the suturing may be postponed a few days, in the meantime packing the wound. The same method holds good if it has been necessary to open the sinus.

The advantages which I claim for this method are its simplicity, its ease of handling, its better appearance, its rapid healing with perfect safety and the better hearing which results. Although the operation itself is more troublesome and requires a little longer time than the usual operation, the aftertreatment is easier and more quickly done each day and less painful to the patient. Again, it avoids the disfigurement of a wide scar behind the ear, or the equally unpleasant postaural depression occasionally seen. Third, my method gives more rapid healing. It is rare that an ordinary mastoid wound is fully healed under eight weeks, while here we may obtain healing in from five to six weeks. And aside from the great advantage of the more rapid healing of the whole wound, is the great importance of the prompt healing of the postaural incision, for with this method the bandage may be entirely discarded in ten days. In general, also, by this method the hearing is better than by our present method of operation, because the canal is not narrowed, as is now often the case, by a partial prolapse of the posterior wall, but, on the contrary, it is widened, leaving a free canal.

As I have thus far done this operation in only five cases my paper is offered as a preliminary report on a new operative procedure; but as these cases include very severe mastoid conditions, in which my results have been exceedingly satisfactory,

I have felt justified in offering for your consideration this description of the operation, and will give a brief resumé of my cases, and show you three patients:

CASE 1. (H. W.) The first case on which I did this operation was that of a simple mastoid with mixed infection in a man 24 years of age. There was in this case an exostosis of the posterior canal wall, which made it necessary to open the membranous canal. The dressing of this case was difficult on account of a congenital subluxation of the inferior maxilla which distorted the canal. The ear, however, was dry in nine weeks, while the posterior wound was completely healed under the first dressing.

CASE 2.—(M. H.) A man 31 years of age. The discharge had been present three weeks. The smear showed a streptococcus capsulatus infection. In operating it was necessary to expose the sinus over a large area. Under the first dressing the posterior wound healed throughout, with the exception of half an inch at the lower angle, which healed under the second dressing. The rest of the wound was dry in eight weeks.

CASE 3.—(N. L.) A woman 35 years of age with a four days' history of discharge, which showed a streptococcus infection. The operation exposed the sinus over a large area, including the knee. The zygomatic cells were also involved. The posterior wound healed under the first dressing. The wound was dry in a little less than eight weeks.

CASE 4.—(P. D.) A woman 47 years of age. The discharge had been present 19 days and showed a pneumococcus infection. The case was a very severe one. On admission there was a large subperiosteal abscess. The canal was so much narrowed by swelling that the membrana tympani could not be seen. The mastoid destruction was very extensive and involved also the zygomatic cells. There was, besides, a large epidural abscess in the middle fossa, and a perisinus abscess; and both of these exposures were covered with thick, velvety granulations. Here, on account of the superficial inflammation caused by the subperiosteal abscess, the incision behind the ear did not heal by first intention through its lower half, but was closed by a second suturing at the end of a week, and healed promptly. In this case, at the end of two weeks, I inserted a small skin graft through the meatal opening. Part

of this graft took, and helped to make the cicatrization more rapid. The cavity healed in five weeks and two days.

CASE 5.—The last case is yet under treatment, and so I cannot give any definite report on it at this time.

All my cases have been operated on at the New York Eye and Ear Infirmary, and all were ward cases.

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LXIII.

A CASE OF PRIMARY CARCINOMA OF THE TRACHEA.

By T. P. Berens, M. D.,

New York.

At the meeting of this Association in 1906, Theisen read an exhaustive paper on the subject of Primary Carcinoma of the Trachea. After excluding all doubtful cases, both as regards diagnosis and location, he gathered 27 cases and reported one case from his own practice, making in all 28 cases. In 1908 Nager (*Archiv fuer Laryngologie und Rhinologie*), in a lengthy article quoted 8 cases, including one of his own. Of these 8 cases, one was Theisen's case, one was a case reported by Schroetter, Jr. (*Klinik der Bronchoskopie,* 1907), and the remaining six quoted by him had already been quoted by Theisen. The writer, after a somewhat arduous search through the literature, accepts Theisen's classification as correct, and has found to date but 30 cases of primary tracheal carcinoma,—to which number he would add the following report of a case from his own practice:

The patient, a man 55 years old, was seen in consultation with Dr. J. M. Bleyer, who gave the following history: The patient had always been healthy; there was no specific history, but a brother had recently died from carcinoma of the stomach. The patient had consulted the doctor about nine months before, because of a persistent cough. The cough grew worse, and attacks of dyspnea had become a marked symptom, increasing in severity and frequency. A subglottic tumor had been seen by Dr. Bleyer. The patient was a large man, weighing 175 lbs., with a short, thick neck. Examination revealed both vocal cords reddened and slightly thickened. Beginning at the second ring of the trachea was a grayish-pink velvety appearing mass, which occupied all sides of the trachea, and diminished its lumen to about one-third of its

natural size. The mass was higher and thicker on the right side, and apparently faded into what appeared to be thickened mucous membrane on the left side, where the third tracheal ring was visible. Dyspnea was marked; and he was placed in the Manhattan Eye, Ear and Throat Hospital, where, the day following, under general anesthesia, the following operation was performed: After division of the soft parts and ligation of the isthmus of the thyroid gland, the trachea was incised from the larynx to the sternal notch. A successful effort was made not to wound the mucous membrane of the trachea until the rings had been divided. Adrenalin was then applied, and the mucous membrane incised without bleeding. The larynx was likewise split without hemorrhage. The larynx was found to be free, but beginning at the second ring the walls of the trachea were occupied by an infiltrating fungoid appearing growth that extended an inch below the sternal notch. The surface of this growth was velvety and of a grayish rose-pink color. Owing to its extension so deeply down the trachea, exsection of the latter was out of the question; so that an attempt was made to remove the mass by means of a sharp bone curette, and apparently the attempt was largely successful, for the result of the curettage left normal appearing tissue. The growth was not adherent to the rings and did not extend beyond the limits of the trachea. A large and long tracheotomy tube was inserted and the wound stitched. The silver tube was not sufficiently long and a large rubber drainage tube was inserted through it. Although the operation consumed less than an hour and the loss of blood was insignificant, the patient suffered considerably from shock. There was but silght fever, at no time more than 101 degrees; but the patient did badly and died of pulmonary edema and heart failure three weeks after the operation. Postmortem examination was not allowed. Examination by Dr. Jonathan Wright of the tissue removed showed it to be a columnar epithelioma.

ABSTRACTS FROM CURRENT OTOLOGIC, RHINOLOGIC AND LARYNGOLOGIC LITERATURE.

I.—EAR.

A New Treatment for the Meniere's Symptom Complex.

HERZER (*Münch. med. Wochenschr.*, No. 20, May 18, 1909). In a typical case of Meniere's disease which had proved incurable by other methods of treatment, Herzer used with brilliant success the vibrations massage of the nasal mucous membrane.

Horn.

Three Lectures from the Domain of Ear Diseases.

SCHWARTZE, Halle (*Münch. med. Wochenschr.*, No. 21, May 25, 1909), again warns against the use of Bier's hyperemia in acute otitis. He considers it dangerous, only to be carried out in a hospital and where a suspicion of an intracranial complication is present, absolutely contraindicated. With the prompt alleviation of pain which always follows the use of the elastic bandage, goes hand in hand a destruction of the mastoid process and thrombus of the sinus, until finally we are suddenly confronted with a very dangerous condition.

The use of the pressure sound of Lucae in sclerotic conditions is fully discussed, and Schwartze warns against its use in all atrophic conditions of the drum, and wherever a hyperemia of the promontory can be seen. In sclerosis he has seen no improvement from the use of phosphorus, after the method of Siebenmann. In early cases one may perhaps be justified in its use, in late cases never. The etiologic basis of otosclerosis is considered. Where a suspicion of hereditary syphilis is present, and the disease not more than six weeks old, an energetic mercury cure may lead to a permanent improvement. The cold water cure, sea-bathing and high altitudes are strictly contraindicated. The use of fibrolysin is yet a debatable question. In a series of 75 cases treated in his clinic, two were unquestionably improved. The use of the leech, in otitis media acuta, has been too much neglected, and he warmly recommends its more general application.

Horn.

The Quantitative Measurement of the Caloric Nystagmus in Acute Inflammation of the Middle Ear.

Oscar Beck (*Beitrag. z. Anat. Phys., etc., des Ohres, Nasen. u. des Halses,* Bd. 11, 1908, p. 190), after a very careful study of three cases, says that the time of the appearance of a caloric nystgamus after the beginning of the injection of the water, in cases of acute inflammation of the middle ear, depends upon the degree of inflammation. That is, in individuals with normal labyrinths the time of the appearance of the nystagmus depends upon extralabyrinth conditions, such as the quality of the conduction of the heat due to the intensity of the inflammation in the middle ear. This dependency is sufficient to permit one to judge the degree of inflammation in the middle ear by the time of the appearance of the nystagmus. The time of the persistence of the caloric nystagmus, however, is entirely independent of the degree of middle ear inflammation.

Wood.

A Case of Entotic Tinnitus Objectively Perceptible.

H. Halasz (*Monat. für Ohrenheilkunde sowie für Kehlkopf, Nasen, Rachenkrankheiten,* Vol. XLII, p. 408-411) says that there have been about 40 cases reported of ear noises which have been objectively perceivable. He reports a case of his own in a woman 35 years old, who for one year had had a blowing tinnitus in the left ear, which was so loud as even to disturb her sleep. This was accompanied by a finer, higher tone, which was very transitory. Anyone who was near her left ear could hear these sounds. No pathologic lesion could be found in the nasopharynx, or middle ear. The superficial temporal artery, however, could be easily felt with the finger, and pressure on this artery caused cessation of the tinnitus. The tinnitus could be heard with a stethoscope placed over the artery. Halasz proposed to tie the artery, but the patient refused to have the operation done. *Wood.*

A Case of Cerebellar Abscess.

Sack (*Monatssch. f. Ohrenh., etc.,* Heft 7, 1908, p. 360) reports a case of cerebellar abscess of otitic origin which was due to an infection of spirillum and Vincent's bacillus. The patient, a girl 5 years old, came into the dispensary with severe general symptoms and a left-sided facial paralysis. She had had

otorrhea for two years. Her symptoms were marked drowsiness, pain in the left ear, no headache, temperature normal, pulse 115, no rigidity of the neck muscles, horizontal nystagmus, more marked to the left, uncertain atactic gait and a tendency to fall toward the left. A radical operation was done and a sequestrum of a part of the labyrinth, including one and a half turns of the cochlea, was removed. The dura was exposed in the middle cerebral fossa, but was found normal. After the operation the pulse fell from 115 to 62, and the nystagmus became more marked towards the right. A second operation was refused, and the patient died on the fourth day after the operation. At the postmortem the cerebrum and dura were found to be normal. The left half of the cerebellum was enlarged, and while normal on the outside contained two abscesses each about the size of a cherry in which were found a spirillum and Vincent's bacillus. *Wood.*

The Treatment of Otosclerosis With the Faradic Current.

ZITOWITSCH (*Monatssch. f. Ohrenh., etc.*, Vol. XLII, 1908, p. 597-627) reports 20 cases of otosclerosis which he treated by faradization, with more or less success. With one or two exceptions all the cases showed increase in the hearing and decrease in the tinnitus, though the extent of the improvement varied considerable in the different patients. Zitowitsch says that the lack of resiliency of the drum membrane in these cases is due to the inactivity of the tensor tympani muscle, which is in turn accompanied by a lack of activity of the stapedius muscle. This absence of muscular action within the tympanic cavity causes a decreased movement of the ossicles and gives rise to a lymph stagnation and vascular congestion in the region of the round window and promontory. Politzeration and pneumatic massage are harmful because they tend to increase the congestion and do not bring about active movement of the tensor tympani. In the application of the faradic current one electrode should be introduced into the mouth of the Eustachian tube and pressed against the upper wall, while the second electrode is placed in the interval between the angle of the jaw and the mastoid process. The intensity of the current depends on the individual and should be about as strong as the patient can bear. The treatment should last three or five minutes and not repeated oftener than three times a week.

Wood.

Concerning Venous Evacuation in Otitic Thrombosis of the Lateral Sinus and Pyemia.

KARL THEIMER (*Monats. für Ohrenh., etc.*, Vol. XLII, 1908, p. 527), who has been working in Alexander's clinic, reports three cases of otitic pyemia, all of which completely recovered, which were treated by the ligation and resection of the internal jugular and the establishment of a jugular fistula after the method of Alexander. He says that the establishment of the fistula affords good drainage to the sinus and the jugular bulb. Ligation of the vein before the operation on the ear prevents the possibility of aspiration of air during the operation on the sinus, and also it makes it impossible for any thrombosis which may possibly be loosened during the operation to enter the general circulation. Just as soon as the diagnosis of otitic pyemia of sinus thrombosis can be made, the ligation of the jugular and its resection should be undertaken. *Wood.*

A New Method for the Detection of Complete One-Sided Deafness.

PROF. D. O. VOSS (*Beitrage z. Anat. Phys. u. Ther. des Ohres, der Nasen u. des Halses*, Bd. 11, 1908, p. 145-152), after trying several methods found that in cases of one-sided deafness the good ear could be made, for the moment, completely deaf by blowing a continuous stream of air directly into the ear. This was most easily done by a compressed air outfit. While the air was being blown into the ear, the very loudest tones, noises and calling were absolutely imperceptible. The application of the test can best be done by producing a tone, especially selected for testing the degree of deafness, in close proximity to the deaf ear. Air is then blown into the good ear, and if the tone disappears to reappear on cessation of the air stream, it shows that the tone was perceived by the good ear and not the one being tested. *Wood.*

Concerning Deafness Following Typhoid Fever.

PAUL MANASSE (*Arch. für Ohrenh.*, Vol. 79, 1909, p. 145) had for some time noticed that during epidemics of typhoid fever a number of cases showed clinical evidence of a labyrinthine or nerve deafness. The majority of these patients recovered easily, and only rarely did the condition persist. Recently, in one case in which the typhoid deafness persisted,

Manasse was able to obtain an autopsy and make a careful microscopic examination of the petrous bone. The condition found was a chronic fibrotic change of the internal ear, consequent upon an acute process, and followed by a secondary atrophy of the labyrinth. A similar case had been reported by Sporlader in 1900, in which there was fibrotic degeneration so that both the ganglion cells in the spiral ganglia and the finer nerve fibers in the cochlea were replaced by connective tissue fibers. Manasse, though acknowledging the material at hand is too small to make any positive conclusion, believes that the deafness of typhoid fever outside of otitis media may be due either to an inflammation of the internal ear or of the auditory nerve, and that in the majority of cases this inflammatory process completely heals, though occasionally under certain conditions it may become chronic and permanent deafness result. *Wood.*

Nasal and Nasopharyngeal Conditions as Causative Factors in Middle Ear Diseases.

GEO. A. LELAND (*Boston Medical and Surgical Journal,* September 30, 1909) advocates a more comprehensive inspection and a more thorough treatment of the nose and nasopharynx as a preventive of the pathologic conditions of the ear. With very few exceptions, the nose and nasopharynx are the initial offenders in ear diseases. A normal middle ear depends upon perfect ventilation, normal nasal respiration and a normally functionating Eustachian tube. The aurist should begin as a rhinologist. His treatment should be prophylactic rather than palliative. All nasal and nasopharyngeal obstructions should be corrected, particular attention being directed to the fossae of Rosenmüller and the regions of the Eustachian tubes.

With a perfectly ventilated middle ear, conditions ranging from permanent deafness to isolated symptoms, such as pain, fullness, tinnitus and vertigo, would for the most part have no inception. *Ryder.*

Mastoiditis Complicated by Purulent Leptomeningitis, Epidural Abscess, and Sinus Thrombosis.

ALFRED BRAUN (*Medical Record,* October 16, 1909) reports a case of complicated mastoiditis, unoperated, of considerable interest from the fact that an autopsy revealed a con-

dition not at all in accord with the clinical picture. The classical symptoms of mastoid involvement, tenderness, and inflammatory signs in the membrana tympani, were absent. The drum was merely dull and thickened, possibly a little pinkish. Five weeks previous the patient had a painful, discharging right ear, with some deafness and tinnitus, which had lasted about six weeks. Slightly turbid cerebrospinal fluid following a lumbar puncture pointed to central involvement, but there was no rigidity of the neck, no Kernig's sign or Babinski's, no hyperesthesia, no anesthesia, and no pupillary changes.

The autopsy showed the mastoid process reduced to a mere shell, with pus in the middle ear, antrum, and mastoid cells. There was also a purulent leptomeningitis, with an extension of the purulent process from an epidural abscess to the pia through an apparently normal intact dura. *Ryder.*

Superficial Dermatitis of the External Auditory Canal.

CLARENCE J. BLAKE (*Boston Medical and Surgical Journal,* August 5, 1909). Its peculiar glandular structure, its function, and its relation to an important organ of sense make the skin lining the external auditory canal of more importance than it would otherwise be. Under normal conditions, by a well-defined movement of the epidermis of the drum head and the inner part of the canal wall outward, the effete epidermis is disposed of. An obstruction to this normal disposition results in an accumulation of detritus. In accordance with the differences in structure of the skin lining the canal, there are differing degrees of vulnerability and different symptoms of disturbance, but in all the primary mechanism is a dermal hyperemia with serous transudate and elevation of the thin epidermal layer which, under maceration disintegrates and, mixing with the serum, affords an outflow macroscopically simulative of pus.

Treatment.—Thorough cleansing by syringing with a weak solution of sodium bicarbonate, carefully drying, and repeating until the exfoliated epidermis has been removed. Paint the denuded surface with silver nitrate, 12 to 15 per cent strength, and touch any spot of ulceration or granulomata with stronger solution. *Ryder.*

Diagnosis of Otogenic Meningitis.

HOLGER MYGIND, Copenhagen (*Journal of the A. M. A.*, September 11, 1909). In contrast to the usual impression of middle ear retention in otogenic meningitis, Dr. Mygind has found, as a rule, no otoscopic signs of retention of pus, and in only one-half of the cases has he found any mastoid tenderness or infiltration. The nature of the suppuration, combined with the anatomic relations of the petrous portion of the temporal bone and the mastoid process, play the most important part in the pathogenesis of otogenic meningitis. In most cases of otitis media causing meningitis there is a very marked osteitis of the mastoid process. It may be produced through a suppuration of the labyrinth. Sigmoid sinusitis is not infrequently the medium. It is often combined with suppurative otitis intima and with sinus phlebitis. The diagnosis is difficult, as it is difficult to decide whether the meningitis is due to the otitis media present or the latter is a complication. It must be distinguished from any infectious disease or from pneumonia. It may simulate or be simulated by "meningeal irritation" or "meningismus." The one unfailing sign is turbidity of the cerebrospinal fluid. Two other points of diagnostic value are: the examination of the hearing and the static function of the labyrinth; total deafness speaking in favor of a labyrinthine suppuration with secondary meningitis. If the static part of the labyrinth is destroyed, there is no nystagmus when the ear is syringed with cold water. Destruction of the static portion of the ear points to meningitis produced by suppuration of the inner ear. *Ryder.*

Adequate Drainage the Essential Step in the Successful Surgery of Brain Abscess.

FRED WHITING (*Medical Record*, January 23, 1909) thinks that the high mortality in brain abscess cases (accurately diagnosed and skillfully evacuated) depends to a great extent upon the failure of proper drainage. The findings at two autopsies, showing discolored and softened areas of brain substance around the cavity and drainage channel, he attributed to trauma, resulting from improper methods of establishing drainage. The introduction of the finger into the abscess cavity he considers a bad surgical procedure and has devised an

instrument called an encephaloscope, which allows minute inspection of the abscess cavity and the opening thereto.

Points to be observed in drainage are as follows:

Complete evacuation. Careful and minute inspection of the entire cavity wall, thereby locating any pocket or channel of communication. For the drain itself iodoform gauze is the best. In acute cases, after complete evacuation, there is little danger of the cavity refilling. A single small wick to the bottom of the cavity is sufficient. This is changed at intervals of 48 hours. In chronic cases the treatment is entirely different. The cavity must remain open until the dense, firmly resisting, fibrinoplastic membrane sloughs away or undergoes absorption. Daily dressings, carefully wiping out the entire cavity and its walls, and then introducing enough gauze to balloon the cavity. This procedure is to be continued until the purulent discharge stops. Complete evacuation and thorough drainage, done under inspection and not palpation, are the salient points in the after-treatment. *Ryder.*

The After-Treatment of the Radical Operation on the Middle Ear.

A. JANSEN (*Monat. für Ohrenheilkunde sowie für Kehlkopf, Nasen, Rachenkrankheiten,* Vol. XLII, p. 400-408). Jansen, on account of the disadvantages of continued packing of the wound after a radical operation, has of recent years done away with the packing after the first eight days, and simply applies a solution of nitrate of silver. He claims that the advantages of the nitrate of silver solution, when used in the proper strength, are that active stimulation produces a sufficient amount of granulation tissue; that the cicatrization is likewise stimulated; that the granulation tissue is protected by the white coagulum, and that the excretion from the wound is kept at a minimum. The use of nitrate of silver should be carried out only in cases of complete exenteration of the middle ear, in which some plastic operation has been done on the canal and the posterior wound closed. Jansen's technic is briefly as follows:—After the completion of the operation, the wound is dusted with iodoform powder, and iodoform gauze is carefully packed into the tympanic cavity and into the antrum. This dressing remains in situ for eight days if no contraindications develop. The wound is then lightly packed, preferably with xeroform gauze. This second packing remains

for two days and then the wound is left free. The whole wound surface is, after the removal of the packing, touched with a 5 per cent solution of nitrate of silver. A quarter of an hour later the wound is dried with cotton and again touched with the silver solution. In half an hour the wound is again dried, and a simple protective dressing applied. Six hours later the wound is again dried and painted, and still again on the next day, but after this last dressing the wound is left free, and the patient is instructed to re-apply the dressing only if any secretion appears at the end of the canal. In children it is better to leave the dressing on a few days longer. The wound is repainted with the solution every second day four to five times. After this, if there is excessive granulation tissue, this is gently touched with a 10 per cent solution. In the last six cases treated after this manner, in all of which there was complete healing, the length of time averaged four weeks.

Wood.

The Common and Uncommon Localization of Otitic Brain Abscess, as Illustrated by Two Cases, With Recovery.

B. Sachs and A. A. Berg (*New York Medical Record*, January 23, 1909). Abscess following otitic and mastoid diseases is usually situated in the temporosphenoidal lobe or in the cerebellum, being far less common in other parts of the brain. When situated in the temporosphenoidal lobe, in addition to the usual symptoms of headache, somnolence, nausea, vomiting, and optic neuritis, there will be slight hemiparesis and symptoms of speech disturbance, sensory aphasia from left temporosphenoidal involvement, and dysarthria from right. If in the cerebellum, there will be, in addition to the general symptoms, cerebellar ataxia, diminution or increase of the deep reflexes, abducens paresis, or palsy, acoustic nerve symptoms, and possible cerebellar seizures. If in other parts of the brain, symptoms due to involvement of that special part, provided it is not a silent part, will be present in addition to the general symptoms already referred to. When situated in the motor region, doubt may arise as to the site on account of the relatively slight intensity of the localizing symptoms. There may be paresis instead of paralysis, and the deep reflexes may be less exaggerated than we are accustomed to find in neoplasms of the motor area.

Two cases are reported, successfully localized and operated;

one in the temporosphenoidal lobe and the other in the motor area. The point of interest in the second case is limited largely to the question of localization.

In the surgical treatment of brain abscess there are three important considerations: First, wide exposure of the area where the disease is supposed to lie; second, protection of the meninges; third, proper drainage of the abscess cavity.

Diagnosed promptly and localized correctly, otitic brain abscess has proved the most promising of all brain lesions calling for operative interference. *Ryder.*

The Conservation of Hearing in the Radical Mastoid Operation.

SEYMOUR OPPENHEIMER, New York (*Medical Record,* January 9, 1909). In the radical operation for the cure of chronic suppurative otitis media, it should be the aim, so far as is consistent with the safety of the patient, to restore the auditory organ to as nearly perfect condition as possible, and with due consideration of its function. To this end as much as possible should be saved, provided, of course, that no alterations have taken place in the labyrinth. The continuity of the ossicular chain must be carefully taken into consideration, and if the hearing tests previous to operation show that the ossicles are of some value in the conduction of sound, much will be gained by their retention. Even though superficial necrosis be present in part, it is unnecessary in all cases to remove the tympanic membrane in its entirety, as its retention after drainage has been provided for, will materially aid in retaining the auditory acuity. Probing should be very carefully done, and while all granulation tissue in the antrum, aditus and mastoid cells should be thoroughly removed, that in the tympanum itself should be dealt with very carefully and allowed to remain, unless there is extensive tissue destruction.

The main focus in nearly every case of chronic aural suppuration is the antrum, and this is the primary objective point in all operative procedures. The diseased tissue being removed from this area, the drainage areas lying below these parts will heal when the source of irritation has been removed.

While in some cases it is absolutely necessary to remove all the contents of the tympanum, irrespective of the effect upon the hearing, in many others it will be found that with care

sufficient drainage can be obtained, the tympanic contents preserved, and an improvement in hearing acuity follow operation. *Richards.*

The Treatment of Acute Catarrhal Conditions of the Middle Ear.

WALB (*Deutsche medicinische Wochenschrift,* November 19, 1908) gives the treatment under three headings—acute middle ear catarrh, acute inflammation of the middle ear and acute suppurative middle ear trouble.

Acute Catarrh.—The upper portion of the tympanic membrane is reddened, but there is no swelling. The position of the hammer and the short process can be clearly determined. The patient complains of slight darting pains in the ear, with some deafness. The general condition is not disturbed and, as a rule, there is no fever. Acute catarrhal conditions of the nose and nasopharynx are the most important factors etiologically, the middle ear trouble being the result of a direct extension of the inflammatory process through the Eustachian tube.

This form of middle ear trouble often gets well without treatment of any kind, although this is not always the case. People who are subject to recurring attacks of this kind develop a gradually increasing deafness, with the attending changes in the middle ear. The author believes that inflation of the middle ear by the Politzer method is the best method of treatment for these cases. This has the effect of restoring the ventilation of the middle ear and removing secretions from the Eustachian tube. Wrong methods of treatment are syringing the ear and dropping solutions into the external canal. The application of cold or heat is usually unnecessary. Laxatives and the withdrawal of tobacco and alcoholic stimulants are recommended during the attack.

In considering acute otitis media, the author states that in this form the inflammatory symptoms predominate. It follows an infection, in which the pneumococcus and the streptococcus mucosus are the organisms usually found. The treatment for the first stage should be mainly antiphlogistic. The ice bag and the application of leeches in front of and behind the ear are of the greatest service.

Competent aurists may accomplish the withdraw of blood by superficial incisions in the congested parts of the drum mem-

brane and superior wall of the canal. This antiphlogistic method of treatment should be continued until the active inflammatory process has subsided. During this time inflations of the middle ear are strictly contraindicated, because they favor the development of complications. After the acute inflammatory process has subsided, inflations with the Politzer bag may be carefully used. When a severe desquamative myringitis develops with a throwing off of masses of epithelial scales, irrigations may have to be used, although here, as in the first variety, the author does not favor irrigations. When there is danger of perforation, paracentesis is indicated.

Later on, inflations should be continued until the hearing becomes normal. If improvement has not resulted in eight or ten days and mastoid symptoms develop, a prompt paracentesis should be performed, and in many cases this will clear up the mastoid complication. In this form of middle ear trouble also, inflammatory conditions in the nose and nasopharynx play an important role, and this is particularly the case in children with adenoids and enlarged tonsils. In children who have recurring attacks of acute otitis media, a hyperplasia of the lymphatic ring should always be thought of and proper operative procedures promptly carried out.

In the third form, acute purulent otitis media, a perforation of the tympanic membrane is characteristic. The symptoms in young children, before perforation occurs, are often very alarming (delirium and unconsciousness being sometimes present), and if there is no discharge from the ear, the condition may be mistaken for meningitis. The treatment should be that of an acute infectious process. The patient should be kept in bed and a light diet given. The severe pain in the ear can be controlled only by narcotics, although the ice bag does some good. The tympanic membrane should be incised just as soon as bulging can be determined. Spontaneous perforations, if not large enough for good drainage, should be enlarged, or if they have not occurred in a favorable place incisions in other parts of the membrane should be made. For securing good drainage from the middle ear the author recommends the use of an antiseptic bandage. The canal should be first carefully washed out to remove all accumulated secretion, a 1 per cent normal salt solution or a boracic acid solution being used for this purpose. A strip of gauze is

then inserted in the canal, being carried to the drum membrane, sterile gauze placed against the ear, and a gauze bandage carried around the head. The dressings should be changed as often as necessary, depending upon the amount of discharge.

If this method is effective and the secretions are not retained in the ear, further irrigations are not necessary.

In concluding his consideration of the treatment, the author condemns the use of the Bier treatment in cases of suppurative otitis media. In 20 cases in which this treatment was used unfavorable results were obtained, and a much larger percenatge of the cases had to have the mastoid operation. The cases seemed to improve at first, but then there would be a sudden onset of dangerous symptoms which necessitated a prompt mastoid operation. Attention has previously been called to the fact that the Bier stasis masks one of the most important and serious complications of a suppurative middle ear trouble, a brain abscess. It was found that the Bier treatment relieved the severe and constant localized pain, which is often the only indication of a brain abscess, concealing this important symptom in some cases until it was too late to operate. The Bier method is absolutely contraindicated in cases of suppurative otitis media in which mastoid complications are present. *Theisen.*

II.—NOSE.

Empyema of the Middle Turbinate.

ANDREGA (*Deutsch. med. Wochenschr.*, No. 8, 1909, p. 372). By removal of the middle turbinate it was found that the bone was entirely destroyed and nothing remained but a pus sack, lined with swollen mucous membrane. *Horn.*

The Avery Nasal Septatome.

JOHN W. AVERY, New York (*Medical Record*, February 6, 1909). The instrument is intended to take the place of the small knife usually used for the septal incision. It has a blade adjustable to cut a depth varying from 1/32 to 6/32 of an inch. This blade prevents too deep a cut and so lessens the danger of perforation. An indicator on the handle registers the length of the exposed portion of the blade, and hence the depth of the incision. *Richards.*

On the Treatment of Chronic Suppurative Nasal Conditions by the Use of Lactic Acid Bacteria.

J. L. GOODALE, Boston (*Boston Med. and Surg. Jour.*, July 15, 1909). A series of cases of atrophic rhinitis with ozena and chronic suppuration of the various sinuses were treated with the bacillus bulgaricus, as prepared by the Lederle Laboratories, with the result that a distinct effect was produced by the culture in some cases of ozena characterized by generalized crust formation. In localized chronic suppurative sinusitis, attended by hypertrophy and polyp formation, no effect could be detected. *Richards.*

The Treatment of Nasal Diseases by Means of Negative Pressure.

WALB (*Deutsch. med. Wochenschr.*, No. 1, 1909, p. 22) reviews the uses of negative pressure in the diagnosis and treatment of diseases of accessory cavities and repeats the conclusions already arrived at in the more extensive work of himself and Horn, viz.:

1. Negative pressure enables us to make a better diagnosis than was formerly possible.

2. Negative pressure is a means of treatment, in the acute cases in an absolute sense; in chronic cases, in a relative sense, as we are enabled to at once relieve distressing symptoms, and where the secretory symptoms form the principal complaint, to bring about a cure. When an extensive pathologic alteration of the mucous membrane of the cavities is present a cure is not to be expected.

3. A careful control of the degree of pressure used by means of the quicksilver manometer is of great importance.

4. A constant pressure is only possible with a metal pump. Rubber balls are not to be depended on.

5. The pressure in acute cases should not exceed 8-10 cm. of mercury; in chronic cases, from 12-17 cm.

6. Too much pressure brings about a hemorrhage.

7. In the after-treatment of all operations on these cavities the method has proved of enormous value. *Horn.*

A Method of Approach to the Upper Respiratory Tract.

LUDWIG LOWE (*Monatschr. f. Ohrenh., etc.*, Vol. XLII, 1908, p. 516) suggests the following procedure for exposing

the interior of the nose and sinuses to operative attack. After tamponing of the nasal fossa with packing soaked in 1-4000 adrenalin and injecting the same into the outer surface of the gum, he makes an incision starting at the base of the gum opposite the last molar and carries it forward to the frenum of the lip. The periosteum covering the anterior surface of the maxillary bone is elevated, and the nasal mucous membrane is incised along the edge of the pyriform aperture from the mouth wound. The mucous membrane is now elevated from the lateral wall of the nasal fossa, and then the bony edge of the aperture removed outward to where the thin clear bone of the canine fossa commences, and inward along the outer wall of the nasal fossa until the anterior end of the inferior turbinal is included. The rest of the inner wall of the antrum is now taken away, including the mucous membrane on both the antral and nasal sides, and also the whole of the inferior turbinal. An open path is thus made to the interior of the nose, from which the antral, ethmoidal and sphenoidal sinuses can be easily reached as well as any neoplasm occupying the nasal fossa. *Wood.*

Empyema of the Antrum of Highmore: Its Relation to Other Diseases, and Its Treatment.

WOLFF FREUDENTHAL (*Medical Record,* October 23, 1909). Numerous cases are cited to show how certain conditions may be aggravated by and oftentimes caused by antral sinusitis. Aprosexia nasalis, affections of the stomach and intestines, epilepsy, and eye diseases are often so closely related to antral involvement that great relief and many times permanent cure follows the proper antral treatment. Wertheim's findings, that almost one-third of patients who had died of tuberculosis had empyema of one or more of the accessory sinuses, he thinks is an underestimate.

Treatment.—In certain slight involvements the intranasal method (puncture through the nasal wall) is sufficient. The resection of the anterior part of the inferior turbinate and any considerable amount of the nasoantral wall leaves the sensitive mucosa of the antrum exposed to the varying conditions of temperature, dust, etc., and consequent unpleasant reactions. If after a reasonable time the conditions do not improve; if there is much degeneration of the mucosa; if a bony septum is diagnosed or suspected, a radical operation through the canine fossa is the only satisfactory procedure. *Ryder.*

Acute Inflammation of the Accessory Sinuses, Symptoms, Diagnosis and Treatment.

D. BRADEN KYLE (*Journal of A. M. A.*, September 25, 1909). Acute inflammations of the accessory cavities are usually secondary to acute inflammation of the nasal mucous membranes. Irregularities in the nasal cavities, narrow, poorly developed nostrils, spurs, deviations, and large turbinates, by interfering, first with normal nasal drainage, and then with the drainage and ventilation of the accessory cavities, are predisposing factors.

The symptoms, varied to a certain extent by the location of the sinus, are, for the most part, local, and as follows: Pain of a boring character, swelling, tenderness, bone soreness and a mucopurulent or purulent nasal discharge. Systemic infection is not, as a rule, marked. The sinus is a walled-in-cavity, and consequently there is not much absorption. Of considerable importance in regard to both local and systemic phenomena are the size and shape of the cavity and the variations in the thickness of its walls. Brain abscess may result from perforation of a wall of the frontal sinus. Again, if the superior wall of the antrum is thin, there will be marked eye symptoms, while in another case, with a thick, bony wall, the eye will not be affected.

Diagnosis is made from the clinical history, physical examination, and the X-ray. Transillumination is not reliable. The use of the X-ray cannot be overestimated. It shows the extent of the involvement, the relation to the structures and the formation of the cavity.

The treatment, in a great majority of cases, should be conservative, directed toward the re-establishing of the normal drainage. A careful and persistent shrinking of the tissues at the orifice of the cavity in conjunction with measures directed toward the nasal mucous membrane will usually be sufficient. Such palliative measures will not always be successful, but a great many cases now operated upon would respond to such treatment. *Ryder.*

Two Cases of Septicemia Following Submucous Resection of the Septum; One Death, One Recovery.

HAROLD HAYS, New York (*American Journal of Surgery*, November, 1909), reports two cases of septicemia following

submucous resection; one death and one recovery. The histories of the two cases were similar, as were the physical appearances of the patients. Both operations were simple, consuming each less than one-half hour.

Case number one complained of a frontal headache at the time of removal of the packing, two days after the operation. There was moderate bleeding and considerable edema of the mucoperichondrial flaps and a frothy, bloody, serous discharge. A thorough examination between the two layers of septal mucous membrane failed to reveal pus, although the probe went well up to the cribriform plate. Five days after operation the patient was sent to the hospital. Complaints: Violent headache, high fever, and marked exophthalmos, blood count 15,000. One dram of slightly turbid fluid, under pressure, was removed by lumbar puncture. The patient grew gradually worse, dying eight days after operation.

The history of the second case was the same, except that there was no exophthalmos. A careful examination of the nasal chambers under chloroform was made and pus located well up above the middle turbinates. Following its evacuation recovery immediately took place.

Both had symptoms of septicemia, the first probably complicated by cavernous sinus thrombosis and possibly meningitis. Dr. Hays has no doubt that the second case would also have ended fatally had the pus focus not been located. In studying the lymphatic and blood supply of the upper portion of the septum, he finds intercommunicating branches between the arteries and veins of the septum and the arteries and veins communicating with the sinus; hence the possible infection.

Ryder.

The Operative Treatment of Deflection of the Nasal Septum.

CHARLES W. RICHARDSON, Washington (*American Journal of the Medical Sciences,* February, 1909). Gummi of the septum must be ruled out before any operation is done. General anesthesia is preferred, since although cocain answers fairly well for the first half or two-thirds of the operation, if the operation is at all prolonged, the most trying part comes at the end, and many patients suffer quite a little pain and shock, and sometimes become so demoralized as to render the completion of the operation extremely difficult. There is

more bleeding under general anesthesia, but, on the whole, the author finds this method more satisfactory than local anesthesia.

He does the submucous resection, protecting the two flaps with the Killian or some type of nasal speculum, which prevents injury to the flaps. He does not think there is ever a reproduction of cartilage or bone in the area from which it is taken. The flaccid septum becomes tense and later gives a certain firmness of sensation. He has not seen any sinking in of the dorsum of the nose. When sufficient bony structure is left above and a fair bridge of cartilage anterior to the seat of the operation, sinking in does not take place.

He has had three per cent of perforations, these often developing from pin-point incisions made into the opposite mucoperichondrium at the point opposite the primary incision. If this occurs, a new incision should be made a millimeter or so farther back, and the perichondrium separated from the septum at that point rather than at the point of primary incision. Perforations are not usually attended by crust formation and give no annoyance to patients, who are not conscious of their existence unless informed of it. The raising of the mucoperichondrium is the crucial point of the operation, requiring great patience and plenty of time. It is best to commence at the upper end of the incision.

The older methods of operating required a shorter time and the wearing of a splint. There was considerable pain and discomfort, with confinement to bed for several days, with the patient uncomfortable and feverish until the splint was removed. In the submucous method there is no postoperative pain, and the patient is practically well at the end of 48 hours. The submucous method offers the greatest advantages in the hands of the operator thoroughly skilled in its technic, but in unskilled and inexperienced hands much more harm can be done by this method than by the methods formerly in use.

Richards.

Concerning an Approach to the Sphenoidal Sinus and the Neighboring Portion of the Basis Cerebri.

LUDWIG LOEWE (*Monats. für Ohrenh. und Laryngo-Rhinologie,* Vol. XLIII, Heft 3, 1909) goes over the whole question of methods of approach to the region of the hy-

pophysis. In 1904 he described the method of operating by which he divided the nasal bones and turned them outwards, fracturing through the lamina papyracea. He describes, further, the Chassaignac-Bruns procedure, consisting in reflecting the nose as a whole to one side. Seven cases are reported as having been treated by the nasal method, one only dying as a result of the operation. The usual method of gaining access to the nasopharynx for large surgical procedures are so severe that the patients would generally stand very little more operative work. His attention was called to the suprahyoid pharyngotomy by Jeremitsch, who had noticed in the case of a suicide that the wound gave a very good view of the nasopharynx and surrounding structures. The suprahyoid pharyngotomy is much superior to the subhyoid operation, because the muscles of the tongue permit an easy closure of the wound by means of serial sutures, and there is also a great deal less danger of aspiratory pneumonia. Loewe's method of operating is briefly as follows:—Gauze strips are introduced into each side of the nose and brought out at the mouth and their ends firmly tied so as to act as a palate retractor, then with the head hanging backward over the end of the operating table, an incision is made about ten meters long just above the hyoid bone, through the skin platysma and fascia. The mylohyoid, geniohyoid and medial portion of the hyoglossus are cut across sufficiently high above the hyoid bone to leave stumps large enough for later suturing. Under guidance of the finger in the mouth, the mucous membrane of the valleculae is cut by the knife placed through the suprahyoid wound. The cut edges of the pharyngeal mucous membrane should be immediately caught and sutures placed in them, as this makes the subsequent closure of the wound much more easy. Hemorrhage is almost entirely absent and it is almost impossible to cut the lingual arteries. A broad slip of gauze is now placed in the wound and brought out of the mouth and both ends tied firmly over the chin. This brings the tongue forward and opens a good view into the nasopharynx. For operating on the sphenoid from this suprahyoid pharyngotomy the instruments must be much longer than ordinary, as the distance from the wound to the roof of the nasopharynx is about 12 centimeters. The shaft of the instruments ought to be about 29 centimeters long, and on account of this length

considerably heavier than usual, to keep them from bending. The mucous membrane on the under surface of the sphenoid is split in the middle line down to the bone, and a sagittal incision made across the tops of the choanae. The periosteum is now shoved back on either side and the under surface of the sphenoid bone and the basal surface of the occipital bone laid bare back to the pharyngeal tubercle. The removal of the floor of the sphenoidal sinus should be begun immediately at the tops of the choanae, and after the cavities have once been entered they then can be enlarged backwards. In removing the lateral portions of the floor, great care must be exercised not to wound the upper and outer walls of the sinus because of the important structures in relation to it. Any cavities which may exist in the pterygoid processes are opened up in a posterior direction and the intersphenoidal septum removed. The roof of the sinus is now easy to attack, and the hypophysis and surrounding region of the basis cerebri easily uncovered. In after-treatment, Loewe prefers not to pack the cavity, as he believes that packing interferes with drainage. *Wood.*

The Radical Operation on the Antrum of Highmore From Within.

RETHI (*Wiener medicinische Wochenschrift,* No. 1, 1909) first described the method of opening the antrum of Highmore through the nose seven years ago.

The important point in this operation is to make a large opening into the antrum through the nasoantral wall. The lower turbinate and the lateral wall of the inferior and middle meatus are first thoroughly cocainized and adrenalin applied, and then the anterior two-thirds of the inferior turbinate removed.

An opening is then made with a chisel behind the anterior end of the turbinate and is enlarged with bone forceps up towards the middle meatus as well as in the inferior, so that a wide communication is made between the antrum of Highmore and the nose.

The diseased mucous membrane and any granulations are then scraped out.

The advantages of this method are as follows:—The operation is much simpler than the radical Caldwell-Luc operation through the canine fossa. It can be performed in a few min-

utes (four or five), after the cocain and adrenalin have been applied.

The author emphasizes the necessity for removing enough of the inferior turbinate; taking off simply the anterior third is not sufficient. He also states that it is important to have the opening into the antrum extend to the middle meatus, and not confine it to the inferior.

A small opening closes very rapidly and does not allow sufficient drainage.

Almost all authors give the preference to the Caldwell operation through the canine fossa if conservative methods have not been effective.

The operation through the nose is not followed by the severe pain that often goes with the Caldwell operation.

The criticisms that have been frequently made against the operation through the nose are that the antral cavity cannot be thoroughly inspected after the operation, and that it is hard to reach with the curettes, that is, every part of it. This the author states, is not a fact, if a large enough opening has been made. Small mirrors can be carried through the nasal opening into the antrum so that it can be inspected.

The author believes in doing the radical operation in the first place in cases of chronic maxillary sinusitis, rather than to try palliative measures, such as a small opening through the inferior meatus.

The operation through the canine fossa does not cure a larger percentage of the cases than the one through the nasal wall.

Chiari states that in some chronic cases treated in this way he did not obtain a cure in a single case, that is, the discharge did not entirely stop.

Out of fifty-eight cases operated on by the writer, by this method, forty-nine were cured. That is, the discharge of pus has entirely stopped. Nine cases were improved, but not cured. *Theisen.*

III.—PHARYNX.

Dangers Associated with Removal of the Tonsils and Adenoid Growths.

F. C. Ard, Plainfield, N. J. (*Medical Record,* March 6, 1909), has made a careful study of the literature of recent

years, and finds that the removal of the tonsils and adenoid growths has been accompanied by many accidents and not a few deaths. The various methods used to combat the accidents are given. The article should be studied in its entirety. In a case of the author's in which secondary hemorrhage of the tonsil had occurred five days after its removal, he used lactate of calcium with satisfaction. *Richards.*

Tonsil Removal, Opsonic Index, and Immunity.

BRYAN D. SHEEDY, New York (*Medical Record,* September 25, 1909). Normal tonsils are most active during the first two or three years of life, and are not absolutely necessary to the well-being of the individual after the period of childhood. They should not therefore be removed in young children unless they are so far diseased as to have their normal functions interfered with, in which case, instead of being a protection against the inroads of bacteria, they become the portals by which the enemies of health gain their admittance.

Richards.

The Significance of Certain Pathologic Conditions in the Fossae of Rosenmüller.

J. W. JERVEY, Greenville, S. C. (*Medical Record,* September 18, 1909), has found that the removal of the web-like bands oftentimes found attached to the posterior lip of the Eustachian tube is followed by improvement of hearing in many cases. These adhesions and granulations should always be sought for in cases of catarrhal deafness, and, when present, removed. "The index finger is passed through the mouth into the postnasal space and the fossae are firmly and completely swept, to their very bottoms, of all obstructing formations, first one side and then the other being attended to without withdrawing the finger. This is followed by the application of a solution of nitrate of silver or argyrol." *Richards.*

Clinical Manifestations of Adenoids in Adults.

OTIS ORENDORFF (*Journal of A. M. A.,* September 23, 1909) calls attention to the fact that the adenoid as a source of trouble is often overlooked in the adult. There is a history of adenoids in childhood, with obstruction. As the child matures, the fauces and nares enlarge and the symptoms of

obstruction disappear, although the adenoids may not atrophy. The patient then complains of trouble of a different type. Inspection in these cases shows the usual high arched palate with the adenoid fringe, an enlargement of the lingual papillae with nodules on the posterior pharyngeal wall—granular pharyngitis. No other treatment than complete removal is satisfactory. *Ryder.*

Spoon Enucleation of the Tonsil.

A. MORGAN MACWHINNIE, Seattle (*American Journal of Surgery*, November, 1909), concludes that hemorrhage following tonsil operations is due, for the most part, to the fact that some of the tonsil capsule is left, or it may occur if some fibers of the superior constrictor muscle have been brought away. A stubborn hemorrhage of the oozing variety occasionally met with is probably due to the fact that the tonsil capsule is composed of fibrous tissue. He has devised a spoon instrument with which he is able to remove the tonsil with capsule intact and with no injury to the pillars or the superior constrictor muscle.

His technic is as follows: The tonsil is grasped well into the supratonsillar and intratonsillar fossae, so as to engage the capsule as well as the tonsil. The spoon is then entered between the posterior pillar and the tonsillar capsule and made to rapidly separate from below upward to the supratonsillar fossa. The same process is carried out inferiorly and anteriorly.

The spoon fits so accurately over the tonsil that injury to the pillars need not be considered, and the extreme traction brings the tonsils so well forward into the pharynx that very little separation is necessary. He finds no difficulty in removing tonsils under local anesthesia. *Ryder.*

The Functional Relation of the Tonsil to the Teeth.

GEORGE H. WRIGHT (*Boston Medical and Surgical Journal*) calls attention to the fact that there are four periods in the development of an individual, from two to eighteen years of age, when the tonsil may become enlarged, without infection. These periods correspond to the time of eruption of the four groups of molar teeth, from two years, six years, twelve years, and eighteen years. He claims that under prophylactic treatment and care the tonsils will return to normal after the

eruption of the teeth. Following out the anatomy and histology of the teeth and their intimate relation to the lymphatic system, he maintains that the tonsils are simply physiologically enlarged from excessive functional activity, the equilibrium of the glandular system being disturbed by the amount of activity necessitated by the elaboration of the 48 teeth and the jaws and the taking care of the accompanying waste. This may be further disturbed by pathogenic organisms derived from carious teeth, etc. Following the eruption of the teeth and with the necessary care of the carious ones, the glandular activity ceases and the tonsils return to normal. He records 150 cases followed out successfully (tonsils not removed) and cites other cases of glandular enlargement (tonsils previously removed) clearing up after eruption of the teeth. In the treatment of the tonsil by the specialist he would include as a routine the observation of carious teeth and a recognition of the four periods of eruption coincident with slight enlargement. *Ryder.*

The Local Treatment of Acute Inflammations of the Throat From the Standpoint of Pathology.

J. L. GOODALE (*Boston Medical and Surgical Journal,* No. 26, 1908). In selecting this subject the author states that he was influenced by the analogy existing between staphylococcus infections of the throat and those of the skin. In both conditions we find the same organisms generating toxin at the point of inoculation, and giving rise to a localized inflammation. We are unable, the author states, to formulate fundamental points of distinction between the local phenomena excited by the staphylococcus, the streptococcus, the pneumococcus, the influenza and the diphtheria bacillus. The clinical differences depend upon the strength of the toxin generated. In his paper the author presents the results of examinations into the effects of local applications upon infectious processes of the tonsils and pharynx. The investigations were made with special reference to the effect of antiseptics upon the course of the clinical phenomena. About 40 cases of acute tonsillitis were treated by various antiseptic preparations. Bacteriological examination was made only for the purpose of excluding diphtheria, and it was therefore not possible in most of them to specify whether the organism was a staphyl-

ococcus, streptococcus or pneumococcus. It was observed in a number of cases of acute reddening of the pharynx and tonsils that local applications of various remedies were followed by complete subsidence of the local inflammation. In a further series of cases that were seen early, these applications, particularly the silver salts, were followed by disappearance of the local acute inflammatory manifestations, and the patient appeared for a few hours or a day apparently well, after which time inflammation appeared in a neighboring region, and in several cases which were carefully studied it seemed that the total duration of the inflammation was more protracted than would have been the case if a simple acute tonsillitis had been allowed to take its natural course. When the local manifestations were more advanced and accompanied by general symptoms, as fever and prostration, no improvement was noticed from the employment of local antiseptics. In two cases of severe lacunar tonsillitis, the crypts were irrigated several times a day with permanganate of potash and hydrogen peroxide, with the object of sterilizing, if possible, the focus of infection. On each occasion the immediate effect was to produce pain and swelling in the cervical lymph nodes, which lasted for several hours and then subsided. The author summarizes the results as follows:

1. Acute tonsillitis in the early stage before the appearance of white spots or systemic depression, was apparently aborted in some cases by local antiseptics.

2. In some cases acute tonsillitis, when seen early, was apparently checked by local antiseptics, but inflammation appeared in neighboring organs and seemed to be of protracted duration.

3. The introduction of antiseptics into the crypts was followed by an increase of the local inflammatory process and in some cases by increased systemic absorption.

All the pathogenic bacteria present in the tonsils in acute inflammations of these organs cannot be completely destroyed except perhaps in the earliest stage.

Here there is reason for believing that if a given pathogenic microorganism has developed in the mouth and about the orifices of the tonsils, its activity may be checked by suitable antiseptic applications if the process has not gone too far. If, however, the multiplication of the organisms has extended

beyond a certain point, so that tissue changes are involved, or the system exhibits evidence of toxic absorption, it is improbable that antiseptic applications could destroy completely the organisms present. *Theisen.*

IV.—LARYNX.

Concerning the Use of Bronchoscopy in Cases of Asthma.

GALEBSKY (*Monatssch. f. Ohrenh., etc.*, Heft 7, 1908, p. 359), by means of the bronchoscope, applied cocain and adrenalin directly to the bronchial mucous membranes in two cases of asthma. In the first place there was a distinct reddening of the mucosa in the left bronchus due to a localized bronchitis. In this patient the asthma was temporarily improved by the first cocain and adrenalin application, but a later application for a recurrence did not seem to have much effect. In the second case the cocain and adrenalin stopped almost immediately a very severe attack, and the patient was free from any interference with her breathing for a month and a half.

Wood.

The Technic of the Treatment of Larynx Tuberculosis with Sunlight.

KRAUS (*Münch. med. Wochenschr.*, No. 13, March 30, 1909) speaks of the favorable results obtained by the use of sunlight in this disease and describes a conveniently mounted mirror, by which the patient can reflect the sun rays into his mouth and against the larynx mirror. In patients without fever he recommends a daily treatment of 20 minutes.

Horn.

The Technic of the Treatment of Larynx Tuberculosis with Sunlight.

LISSAUER (*Münch. med. Wochenschr.*, No. 18, May 4, 1909) uses, instead of an ordinary larynx mirror, one with a concave surface. He can by this method so concentrate the rays that an active hyperemia can be brought about, and the patient experiences a sensation of warmth in the larynx. He considers the method as too dangerous to be put into the hands of the patient, but must be carried out by the physician.

Horn.

The Therapeutics of Larynx Tuberculosis with Special Attention to the Sunlight Treatment.

JANNSEN, Davos (*Deut. med. Wochenschr.*, No. 19, 1909) recommends the treatment and has favorable results. Uses plane mirror and warns against the concave form. *Horn.*

The Further Report of a Case of Tracheal Scleroma.

EMIL MAYER, New York (*American Journal of the Medical Sciences*, February, 1909). This case has been previously reported. Ten months later there was a recurrence of the growth, with hoarseness and very marked dyspnea. At this time the new growth was grayish-white in appearance, resembling soft mucous polyps, readily breaking down, and extending one and one-half inches below the larynx. On account of the dyspnea, tracheotomy was required on March 30, 1907. Röntgen-rays in five to six minute exposures were used at intervals of two to three days, from April 1st to May 11th, 1907. On May 17th the patient was discharged well. A year later there is no recurrence and the author considers the case as cured. *Richards.*

Early Diagnosis of Malignant Disease of the Larynx.

WALTER CHAPPELL (*Medical Record*, October 16, 1909). In the early recognition of malignant diseases of the larynx lies the only hope of approaching anything like permanent relief. The usual doctor and patient treat chronic hoarseness in a most casual manner, and months may pass before there is any suspicion that the hoarseness may mean anything serious. The early symptoms are vague and the clinical picture obscure, but an early recognition is possible.

In intrinsic cancer the age and sex (male over 40); location of the growth (the anterior part of the cords more favorable to non-malignancy); infiltration; decreased mobility of the cord; and the slowly but constantly increased dyspnea from the diminished mobility of the cord, are the important points. Added to this may be the microscopical findings.

Beginning extrinsic cancer presents a picture somewhat varied by the location. Epiglottic involvement causing cough, slight dysphagia, and occasional "slips" of food into the larynx. When situated in the ventricles of Morgagni the

diagnosis is more difficult, as in the early stages the growth is not visible. Slight disturbances in the mobility of the corresponding cord are suspicious. Implication of the interarytenoid folds causes a very early hoarseness and dyspnea with early glandular involvement. Pain in the first stage is due to pressure and not to ulceration.

No one symptom is diagnostic, nor is the microscope reliable, exclusive of the clinical picture. The diagnosis may be made from the symptomatology, objective and subjective, confirmed, but not disproved, by the microscopical findings.

Ryder.

Stenosis of the Larynx.

RICHARD H. JOHNSTON, Baltimore (*Boston Medical and Surgical Journal*, August 19, 1909), believes that laryngeal stenosis is best treated by the introduction of increasingly larger intubation tubes. By direct laryngoscopy, especially in children, the diagnosis is easily made and the proper treatment thereby instituted. If the stenosis be incomplete, resort at once to intubation as the only logical method of treatment. In complete closures the difficulties are much increased. Several years may be necessary for a cure. We may succeed in making an opening through the direct laryngoscope and then keep it open by intubation.

Rogers, who has had more experience than any one else in this country, is opposed to any form of external operation and believes that any case may be cured by retained intubation tubes. He removes the tracheal canula as soon as possible on account of danger of tracheal stenosis from prolonged wearing of the canula.

Of three cases of laryngeal stenosis coming under the observation of Dr. Johnston, two were successfully treated by the intubation method. The third case left the hospital before treatment was begun. In one case, after a period of four and one-half months, the larynx, from a condition of complete stenosis, had been successfully opened and the intubation tube introduced. The opening was gradually dilated until a three-year-old tube was comfortably worn. One year from the time first seen the patient died from intercurrent pernicious malarial fever. The second case, after three months of gradual dilatation with increasingly larger intubation tubes, was sent home apparently cured and did not return.

The laryngologist should impress the general profession with the fact that in the early stage, when the difficulty in breathing appears, it is of paramount importance to have the larynx examined for the cause of the trouble. *Ryder.*

Tracheotomy for Foreign Bodies in the Air Passages; Based Upon Fifty-three Successful Cases.

W. F. WESTMORELAND, Atlanta (*American Journal of Surgery,* November, 1909). Weist, from the study of a thousand cases, concluded that the presence of a foreign body in the air passages does not make bronchotomy necessary, nor should it be done unless indicated by dangerous symptoms.

Westmoreland, on the other hand, says that these cases demand immediate surgical interference and that tracheotomy should be done.

Remembering that three-fourths of these operations will be done upon a trachea considerably smaller than a lead pencil and within the length of an inch, and this crossed by vessels and also the isthmus of the thyroid, such accidents as cutting through the trachea or missing it altogether will be easily avoided. A general anesthetic should be used, carried only to the point of quieting. Tracheotomy tubes are not to be used, as the trachea will remain sufficiently patent. A silk thread passed through each edge of the tracheal incision gives perfect control. In a majority of cases the foreign body is expelled immediately upon opening the trachea. If not, the wound is left open until the body is expelled. No instruments should be introduced into the trachea.

After opening the trachea he divides the cases into three classes, management depending upon the class. The first two classes are those in which the body has been expelled at time of operation. In the first of these the trachea is closed at once. In the second class the body is expelled promptly, but drainage is indicated on account of irritation and subsequent infection with its accompanying accumulation of mucus. The wound is left patent with aseptic dressings. The third class includes those cases in which the body is not promptly expelled; the wound again being left open until the body escapes and inflammation subsides. When drainage is no longer indicated the patient is anesthetized and the wound closed.

The symptoms of foreign bodies he divides into three stages.

Obstructive symptoms immediately following the accident; second, irritation produced by its presence; third, inflammation at a later period.

Westmoreland bases his conclusions upon the successful issue of 53 cases. *Ryder.*

V.—MISCELLANEOUS.

A Case of Myxofibroma of the Temporal Bone Combined with Multiple Paralysis of the Cranial Nerves.

SCHWABACH and BIELSCHOWSKY (*Deut. med. Wochenschr.*, May 18, 1909) describe a case with autopsy findings which was at first diagnosed as a tumor of the acoustic nerve. Full description of the clinical side and the nervous findings.

Horn.

Clinical Experience with Calcium Lactate in Hemorrhages of the Upper Air Tract.

W. K. SIMPSON, New York (*Medical Record*, September 25, 1909) concludes as follows:

1. "Clinical experience shows that calcium lactate has a controlling influence in hastening the coagulation of the blood.

2. Its efficacy is more marked in hemophiliac cases, where the coagulation is delayed, than in cases of normal coagulation time.

3. Before operation, especially on tonsils and adenoids, careful inquiry should be made relative to any hemophilic heredity or tendency.

4. In suspicious cases the coagulation period should be determined before operation.

5. It is questionable, if not positively contraindicated, whether such operations should be undertaken in hemophilic cases, other than under the most extreme urgency.

6. In all cases of operations for the removal of tonsils and adenoids, calcium lactate should be given for a period prior to and after the operation, both for its possible effect in diminishing the immediate hemorrhage and in preventing secondary surface hemorrhage.

7. Of the calcium salts, the lactate is more positive in its results, is more agreeable to administer and is less irritating to the stomach." *Richards.*

The Use of Ethyl Chlorid as a General Anesthetic for Operations in the Throat as Especially Applied to Children.

E. MATHER SILL, New York (*Medical Record*, October 23, 1909). Ethyl chlorid given by means of the Ware inhaler is the easiest of all the anesthetics to give. Two or three thicknesses of gauze should be used over the inhaler and the tube removed at intervals to see that the gauze does not become frosted over, in which case it should be changed. When the inhaler with the rubber bag is used, the ethyl chlorid stream goes directly through the small metal tube into the rubber bag, and this precaution is not necessary. The author considers this preferable. When properly given, the patient is under the anesthetic in from two to five minutes. Profound anesthesia is not necessary. Operation can be begun as soon as there is complete relaxation, the conjunctival reflex being present to a slight degree. Immediately upon the completion of the operation and removal of the mouth gag, consciousness returns. The operation is done with the patient lying flat on the operating table and the head slightly lowered. This anesthetic is especially suited for the operation of removal of adenoids and tonsils in children. Where long operations are necessary, ethyl chlorid anesthesia is first obtained, and deep anesthesia continued with ether by the drop method.

Richards.

Brain Tumor with Unusual Symptoms.

J. E. DALE, Fort Collins, Colo. (*Medical Record*, August 7, 1909), reports a case of brain tumor with unusual symptoms; unusual from the fact that the temperature was subnormal during the whole time of observation, and there was no headache. The patient was a male, sixteen years old. He was under observation from July 7, 1908, to September 28, 1908. When first seen there was occasional vomiting, the abdomen was tender to touch, temperature 97° and pulse 75. After the bowels were cleaned out the vomiting ceased, but temperature remained subnormal. On September 3d, following obstinate constipation, there was an attack similar to the first, only more severe. Temperature was 97.5. Between the two attacks the temperature varied from 96 to 97.5. On September 28th, following two days of complaining bitterly of difficulty in breathing, although respiration was apparently normal,

the patient died. Paralytic symptoms appeared one hour before death. The usual headache symptoms were entirely absent. Autopsy showed a small warty growth (endotheliomata) attached to the roof of the fourth ventricle, slightly to the right of the median line, directly over a point in the floor slightly posterior to the center. The late effect on the respiratory center was to be expected from the situation of the tumor. The early and constant effects on the heat centers is hard to explain unless from leucocytic infiltration. *Ryder.*

Recent Advances in the Field of Laryngo-Rhinology.

VON EICKEN (*Deutsch. med. Wochenschr.*, No. 1, 1909, p. 22). The original work done in this field during the last two years is carefully reviewed. In almost every branch something new has been discovered. Especially discussed is: The method of Killian for the treatment of hay fever; the use of hard paraffin in the treatment of ozena; the use of suprarenal extracts as an aid in the diagnosis of nasal conditions; the light therapy of Brunnings in acute accessory sinus disease; the use of negative pressure as an aid in the diagnosis of diseases of the nasal cavities, according to the methods of Walb and Horn; the radical operations of Killian, Denker and Luc-Caldwell in the treatment of this class of cases. Tremendous strides have been made in the use of the Roentgen photography, but the work is not nearly completed. Horseley, Semon, du Bois-Reymond, Onodi, Kuttner and others have contributed important work on the innervation of the larynx, but the question is still unsettled. *Horn.*

Observations on the Relation of Diseases of the Upper Air Passages to Asthma, Cough and Disorders of Digestion.

THOMAS R. FRENCH (*Long Island Medical Journal*, October, 1909). Many of the neuroses of modern civilization are so obscure and shadowy that we do not pretend to understand them. What we do know is from empirical clinical experience. Enthusiasm and hasty judgment of some of the writers have led them too far. Their claims have not been verified and the theory of reflex irritation has been rejected. The direct relationship between nasal abnormalities and reflected phenomena is not always evident, but it is beyond dis-

pute that such relationship does exist. Polypi and hypertrophy of the turbinated structures do in certain cases cause asthma, and the correction of a deflected septum will cure a cough.

French takes up three phases of the subject, viz.: First, the nose in relation to asthma; second, the nose in relation to cough; third, nasopharyngeal catarrh in relation to gastric and intestinal indigestion.

The Nose in Relation to Asthma.—In determining the cause of spasmodic asthma he thinks it wise to eliminate other conditions, thoracic, abdominal and pelvic, and then examine the nose. Hypersensitive nasal mucous membrane may have as an underlying cause some gross fault of elimination, a diathesis, or some organic disease. Turgescence of the erectile nasal mucous membrane may be and often is caused by transmitted vasomotor irritation from distant parts of the economy. When swollen tissues or sensitive areas in the nose are suspected, carefully test the same. Shrink the swollen tissues and touch with the probe the suspected areas and note results. While the correction of gross nasal lesions holds out the brightest hopes, the relief is often only temporary. Results with the cautery have not been as successful in his hands as in others, but it does occasionally give relief. Great care should be taken in advising operation for relief and still greater care to convey a correct idea of our expectations.

The Nose in Relation to Cough.—While almost any diseased condition of the nose may cause cough, he calls attention especially to that condition caused by contact of the middle turbinate with the septum. If the middle turbinate is flattened to any considerable extent against the septum; if the contact cannot be seen, but the turbinate is prominent and part of it hidden; if there is a high septal deflection against a normal middle turbinate, the introduction of a probe at the suspected point of contact, or the shrinking of the swollen tissues, maintaining the contraction for several days will often settle the diagnosis.

Nasal and Pharyngeal Catarrh in Relation to Gastric and Intestinal Indigestion.—By continuity and reflex action disorders of digestion make their impress upon the mucous membrane of the nose and pharynx. Long experience in viewing these parts will enable one to detect the diseased pharynges due to gastrointestinal irritation. In acute and subacute

pharyngitis the deep red congestion of the posterior wall with little or no redness of the pillars of the fauces or palate points to gastrointestinal trouble. A red tip and swollen nose sometimes accompanies an attack of duodenal catarrh. An impairment of the innervation of the larynx resulting in the weakness and loss of voice may occur during an attack of diarrhea. It is difficult to say whether these conditions occur from reflex action or from continuity.

The factor is an ever-changing one, and the same group of symptoms seemingly produced by the nose and throat in one individual may be induced in another by some other organ. While the nose and throat must be looked upon as factors of large importance in the production of reflex phenomena they cannot be regarded as constant. To obtain gratifying results the laryngologist must also become an internist. *Ryder.*

BOOK REVIEWS.

Verhandlung des Vereins Deutscher Laryngologen, 1909.

A. Stuber's Verlag, Würzburg. Price, 5 marks. The proceedings of the German Laryngological Society, which met in May of this year, are of more than usual interest. To review all of the papers or even to give a list of them would demand too much space. It is not only the articles, but the discussions which are of importance. A requirement for the reading of a paper was originality, and, as I said in my review of the Proceedings for 1908, the matter is not to be found in any other journals. The papers which perhaps created the most interest were: Brunnings, "New Instruments for 1909"; Siebenmann, "Experience with the Galvanocaustic Treatment of Larynx-tuberculosis"; Gutzmann, "The Treatment of Functional Diseases of the Voice"; Meyer, "On Difficult Décanalement"; Schoenemann, "Further Contributions to the Pathology and Treatment of Ozena," etc.

Of the 363 members present, only two were from the United States and one from England. *Horn.*

Die Stirnhöhle (The Frontal Sinus).

By Prof. A. Onodi. Published by Alfred Hölder, Wien. Price, 6.80 marks. The fifth of Prof. Onodi's monographs on the surgical and topographic anatomy of the accessory cavities of the nose, completes a series which has covered many years of most painstaking investigation. His former work on the relation of the optic nerve to the nasal accessory cavities was undoubtedly the basis for the modern conception of orbital pathology. The present monograph will prove a similar stepping stone to a better knowledge of intracranial complications as influenced by diseases of the frontal sinus.

After reviewing the various theories regarding the development of the frontal sinus, he shows by his Röntgen photographs that not until the sixth year is the frontal sinus recognizable as a well-defined cavity.

The comparative value of transillumination as compared to Röntgen photographs is shown by the following figures. In

1200 skulls the frontal sinus was found absent, by transillumination, in 30 per cent on both sides, in 10 per cent on the right side and 10 per cent on the left side. By the radiographic method, on the same skulls, both sides were found wanting in 5 per cent, and right and left, about 1 per cent. The differences in the extent of the sinus, both in a horizontal and vertical direction, varies enormously by the two methods. The various plates simply emphasize the fact that, putting aside for the moment the present questionable position of radiography as a diagnostic agent in pathological conditions, as a preliminary step to a radical operation on the sinus, there is no shadow of a doubt as to its real value.

The text is beautifully illustrated with over 100 life-sized plates. Presswork and paper leave nothing to be desired.

Horn.

Diseases of the Nose, Throat and Ear, Medical and Surgical.

By WILLIAM LINCOLN BALLENGER, M. D. Published by Lea & Febiger, Philadelphia and New York.

The first edition of Ballenger's book received such a hearty reception that a second edition has been necessitated within a year. The author has taken the opportunity thus afforded to review the entire work, to make some important changes and to add some entirely new matter made necessary by the development of the surgery of the accessory sinuses of the nose, the more recent studies on the labyrinth, etc. In our review of the first edition, it was stated that modernity was the keynote. It certainly was a striking feature of the publication, but here we see already in the revision how quickly the changes are developing. We still commend the book for the clearness of its description of operations and the definiteness which characterizes the illustrations.

Tuberculosis of the Nose and Throat.

By LORENZO B. LOCKARD, M. D. Published by C. V. Mosby Book & Publishing Co., St. Louis, Mo., 1909.

The publication of this timely book will be well received by laryngologists, who desire to have a complete treatise upon the subject. The author has divided his theme logically so

that the various chapters are rendered acceptable to anyone who desires to study any particular phase. Of special interest are the chapters devoted to the history, etiology, diagnosis and surgical treatment. The illustrations in color, sixty-four in number, are executed with faithful accuracy and bring out the details to be seen in but very few illustrations of this character.

The author considers formalin as the drug of greatest value for the treatment of the ulcerative and infiltrative types of laryngeal tuberculosis, summing up the advantages as follows:

(1) It surpasses all other bactericides in solutions of a strength which can be tolerated.

(2) In tuberculous ulcers it is fully the equal of, and probably superior to lactic acid.

(3) Its effect upon vegetations is prompt and pronounced.

(4) In infiltrative cases it is by far the most satisfactory remedy.

(5) It is the only drug of the curative class that can with safety be placed in the hands of the patient, thus making it possible to maintain a continuous, cleansing, germicidal and absorbent action.

(6) Its field of usefulness comprises all the varied types of the disease.

Taking it altogether, the work is a most creditable addition to the literature of tuberculosis and to the publications of American medicine in general.

SOCIETY PROCEEDINGS.

NEW YORK ACADEMY OF MEDICINE.

SECTION OF OTOLOGY.

Regular Meeting, November 13, 1908.

A. B. DUEL, M. D., CHAIRMAN.

Case of Chronic Suppurative Otitis Media During Pregnancy in a Fifteen-Year-Old Patient; Sinus Thrombosis; Operation; Pulmonary Abscess and Other Complications.

DR. M. D. LEDERMAN said he considered himself especially fortunate in being able to present this patient as a picture of health after all that she had passed through. She was sent into the Lebanon Hospital (Medical Service) with a tentative diagnosis of intestinal or blood infection, and was not seen by Dr. Lederman until the ninth day after her admission. The patient was 15 years old, father living and well, mother died of tuberculosis, one younger sister living and well. She had measles when 2 years old, and since then had not been ill up to the present time. Her menstrual history began at the age of 13, and has always been regular. Date of the last menstruation three months prior to admission. Five days before admission patient developed a severe frontal headache, followed by fever, which had continued. The day before admission she had several chills, followed by fever, little sweating, and headache. The next day headache again. No pain in any other part of the body. Admitted to the hospital suffering from chills, fever, headache.

The patient seemed to be in good condition, face flushed and eyes bright. Pupils equal and reacted to light and accommodation.

Physical Examination.—Heart normal; pulse regular, but rapid. Lungs, sonorous rales heard over the chest. Spleen palpable at free border of ribs. Cervix soft, admits one finger;

fundus of uterus felt at umbilicus. Diagnosis of pregnancy about fourth or fifth month.

July 28. Temperature 102.6°.

July 29. Had several chills during day. Vomited yellowish fluid at times, but complained of no pain anywhere. Following a chill at 7:30 p. m. the temperature rose to 107.4° F. Slight tenderness in right iliac region.

On July 30 had chills, which seemed to be at regular intervals. Blood examination showed high polynuclear count, but was otherwise negative.

August 4. Temperature 100.2° F. Patient continues to vomit food. Following an afternoon chill, temperature rose to 104° F.

She had a chill almost every day.

On August 5th the patient was comfortable and the temperature was normal. No pain anywhere.

August 6th. Complete physical examination revealed nothing other than a foul-smelling discharge in the right ear. Antistreptococci serum was given. No pain about the mastoid. Right eye showed signs of approaching choked disk. Pain persisted in the right iliac region. Patient was transferred to surgical division, and came under my observation on the following day.

August 7. Some tenderness over the mastoid tip and along the sternomastoid muscle were present, together with slight rigidity of the neck. Chilly sensations were noted.

Upon the above history and symptoms a diagnosis of infective sinus thrombosis was made, and patient was prepared for operation. On removing the mastoid cortex the sinus was found to be discolored and occupying an abnormal position close to the external auditory canal. The parietal wall of the snius was black and sloughing. A foul-smelling thrombus was removed from the lumen of the vessel, extending nearly the entire length of the sigmoid division. Free pus was seen in the region of the antrum. The diseased sinus wall was cut away with scissors the entire length of bone wound and its inner wall curetted. A return flow of blood was established both from the torcular and from jugular end; but as the current of blood from the bulb did not seem adequate, the internal jugular vein was ligated by Dr. H. Roth, one of the attending surgeons, who was present during the operation. Two liga-

tures were placed about the vein, an inch apart, just above the clavicle. No resection was attempted, owing to the patient's condition. The neck wound was closed with sutures.

The same evening the temperature dropped from 106° to 98.2°, and remained there for three readings—12 hours. It then rose to 102°. No chill was observed at any time after the operation. On August 10, three days after operation, the patient aborted a five-month fetus, followed by a slight rise in temperature (to 102.4°). The temperature remained between 103 and 104 for a week. The wound in the neck became infected and had to be reopened. Considerable pus came away.

About this time there were physical signs of pulmonary involvement on right side posteriorly at base of lung. Considerable cough, with a foul-smelling purulent expectoration. These symptoms lasted a little over three weeks. In the meantime, the mastoid and sinus wounds progressed satisfactorily. On account of an increased intracranial pressure an incision one inch in length was made into the visceral wall of the sinus, but only clear fluid, with some disintegrated tissue (resembling brain structure), came away.

On September 8 the patient gave signs of suspected empyema in the right chest posteriorly. She was aspirated and 2 cc. of clear serous fluid was obtained. On the next day the pus expectoration diminished considerably.

On September 16 the temperature was normal.

On September 20 the patient was out of bed, her symptoms having apparently cleared up.

On the 22d she complained of toothache and was found to have quite a large alveolar abscess. This was opened, and in two or three days the swelling in the jaw subsided.

On September 30 the patient was apparently well, temperature normal, and two days later she was discharged from the hospital.

There is no doubt that in this case an earlier operation would have prevented the spread of the infection.

One point of interest is that during the time when the chills and septic temperature were being recorded blood cultures were negative. Repeated examinations showed the polynuclear percentages to be increased in varying degrees, but at no time were bacteria found.

DR. DENCH inquired whether he was right in understanding Dr. Lederman to say that the jugular vein was tied in two places, high up and low down. The case shows clearly the wisdom of taking out the jugular vein, for there is liability of septic infection if it is allowed to remain in. If one examines a specimen, the clot will ordinarily be found running down into the jugular and tapering to a point. The septic material is usually carried into the general circulation through the facial vein, and it is, therefore, Dr. Dench's practice to take out the jugular from a point low down in the neck to a point above the origin of the facial vein.

The case was a most interesting one, and shows the beneficial result of operative treatment in such cases; it also shows how the clinical history may be misleading, and no attention given to the ear unless aural symptoms are particularly inquired into.

Dr. Dench said that he had seen only one case of jugular sinus thrombosis complicated by abscess of the lung, and the patient died 48 hours after the operation from acute gangrene of the lung.

DR. LEDERMAN said that his reason for not removing the vein was that the patient had been on the table so long that further operative procedure was not warranted; the physical aspect of the vessel did not indicate any involvement of its structure.

Thrombosis of the Sigmoid and Lateral Sinus.

DR. W. SOHIER BRYANT demonstrated the case of a boy, 16 years of age, who had had thrombosis of the left sigmoid and lateral sinus, and the adjacent dura mater, and the subjacent cerebrum and cerebellum. A radical operation was performed on the ear, and the jugular vein examined. Later metastatic arthritis and double pyothorax developed.

Final recovery, after two months of sepsis, with the temperature ranging between 97° and 106° F. The temperature reached 105½° on the fifty-fourth day. Efficient nursing in an out-of-door world seemed to be the chief factor contributing to final recovery.

Hernia Cerebri.

DR. W. SOHIER BRYANT demonstrated the case of a girl, 18 years old. When the patient was first seen she had had chronic purulent otitis for a long period. Double radical op-

eration had not controlled the discharge. The last two years she had been incapacitated by extremely severe headaches, chiefly on the left side. The left ear appeared to have the tympanic cavity filled with polypus. A radical operation was performed on the ear. The polypus proved to be a hernia of the dura mater, protruding through the tegmen. In front of this hernia there was a small sinus, leading directly up into the temporal lobe, discharging thin pus.

The opening in the meninges was enlarged and the hernia replaced after extensive exposure of the dura mater. The patient did well for a week, when the symptoms increased with marked signs of cerebral pressure. In a second operation the dura mater was opened wide and explored. About 3½ drams of pus were liberated from the brain. The wound was packed. All went well for five days, when, on account of severe headaches, the nurse cut the bandage, and a hernia cerebri followed, as large as an egg. This was amputated. A second hernia, similar to the first, formed, which was also amputated. A very copious flow of cerebrospinal fluid followed. This flow lasted 25 days. The wound healed solid, but there remained a slight bulging area at the opening in the calvarium. Six months later the patient was seized with a violent headache, became unconscious, and in about three hours was relieved by a spontaneous and very copious flow of cerebrospinal fluid from the fundus of the ear. The fluid came from the opening in the skull. The flow gradually decreased, and in a week the sinus closed, and has since remained closed. The suppuration stopped in both ears.

The eye-grounds remained normal throughout the course of the illness. There were no definite symptoms of aphasia, except at times of the caries.

Dr. Dench said that the difficulty in causing a cessation of the flow of the cerebrospinal fluid, in a case of this kind, was very great. In order to effect a cure it was necessary to secure some method of causing an absorption of the fluid. He believed that the method sometimes employed in cases of hydrocephalus in children might be well suited to a case of this kind. This procedure was suggested by Chene and Sutherland, and had also been employed by Keen. Dr. Dench was indebted for his knowledge of the procedure to its mention in the recent work of Mr. Charles A. Ballance, "Some

Points in the Surgery of the Brain," published about two years ago. The procedure consists in draining the lateral ventricle into the anachroid space by inserting a bent tube into the cranial cavity, one end of the tube entering the lateral ventricle, while the other end terminates in the subdural space. In cases of hydrocephalus the lining of the ventricles seemed to lose its power of absorbing the cerebrospinal fluid, and this same condition may well apply to the cases under discussion. Dr. Dench thought that the procedure was certainly worthy of trial.

Dr. Johnson said that he had a patient with a fracture of the base of the skull, in which the ventricle had been opened and a tremendous flow of cerebrospinal fluid had occurred from the ear—as much as a teaspoonful in a minute. The flow continued for ten days, and when it finally ceased the patient became very much depressed until the reabsorbent function of the ventricle again came into play. The patient would become restless or unconscious, the temperature would mount up, and death would seem imminent. The re-establishment of the ventricular absorption seemed finally to relieve him, however, and he made a satisfactory recovery.

In another case—a fracture of the occipital bone—there was an extensive flow from the ventricle, which continued for over three weeks. In each of these cases, when the cessation of the flow came, the patient would become very uncomfortable and restless, and when this period of discomfort subsided, after a day or two, the patient's condition improved and he had recovered.

In a case like the one reported, in which operative removal of a cerebral hernia was followed by so large a flow of ventricular fluid, the condition would seem somewhat analogous to cases of traumatism such as he had just related.

Dr. Lederman said that Dr. Bryant's remarks recalled a fact in the case which he himself has just reported—that there was increased cranial pressure. When he made an incision into the visceral wall of the sinus a large quantity of clear fluid came away with what seemed to be a quantity of broken-down brain tissue, but no pus. A cerebral hernia appeared through this incision, about the size of a large hickory nut. This was left alone, and finally it disappeared without further annoyance.

DR. KOPETZKY said that the case presented very interesting features, but, in regard to the brain hernias, he thought that early attempt should be made to replace the protruding part of the brain. When thus attempted at an early stage in the procedures, before retaining adhesions had formed, the protruding part of the brain is gradually pushed back by graduated pressure exerted by pads placed over the hernia. He did not think it wise to cut off the protruding brain substance, although sometimes that was an unavoidable act. In regard to the flow of cerebrospinal fluid, he had observed a case wherein, after incision of the meninges to relieve a serous meningitis, a very free flow of fluid kept up for many days, but the patient recovered, and the flow gradually stopped. It was to be expected that a free flow of fluid would follow opening of the meninges, and was regarded by him as a rather favorable prognostic sign.

DR. DUEL said that not many years ago such a case would have caused much discussion, but they are now seen so frequently that we hear very little about them.

Case of Labyrinthine Disease.

DR. A. B. DUEL presented a man, colored, 47 years old, a Porto Rican, who had lived in New York for many years. His history dates back nearly 17 years ago, when he first had an acute abscess in the middle ear, with a discharge which continued for several weeks, perhaps months.

Later, when he first went to a clinic for treatment, "a large mass of foul-smelling material was removed from the ear." At that time he had most interesting attacks of vertigo, and certain experiences—as when he looked upon "the sudden running up of a curtain" would cause him to faint. Certain sounds also would cause him to fall on account of vertigo. Following removal of the material from the ear the discharge ceased. At intervals of two or three years he has had similar large masses—always ill-smelling—removed from the ear. When he came under Dr. Duel's observation, he had removed, after considerable effort a cholesteatomatous mass as large in diameter as an index finger. The bony excavation was very large in the attic and hypotympanic region. Part of the drum and ossicles still remain.

An interesting point in this case is the fact that the lower

tone limit is very good (90 V. S.), and that his upper tone limit is not much lowered; his hearing distance is as good for both the acumeter and whisper as in most successful radical operations.

Another interesting point is the possibility of his having had a labyrinthine suppuration which affected only the semicircular canals. He has entirely recovered his equilibrium, and has fairly good hearing remaining on the affected side.

In reply to an inquiry from Dr. Dench, as to whether the patient had had any nystagmus, Dr. Duel replied that he now has a slight horizontal nystagmus on looking away from the affected side; none on looking toward the affected side.

After rapid turning toward the diseased side, a nystagmus —still more marked—was noticeable. Both the spontaneous and the induced nystagmus were in the direction of the sound ear.

Dr. Lederman recalled the case of a colored woman whom he had presented before the section. She had been shot with a 32-caliber revolver, held about six inches from her head. The bullet went through the tragus and carried away the posterior portion of the drum, lodging against the under and posterior portion of the middle ear. The injury had taken place three years before Dr. Lederman examined the patient. She complained of a facial paralysis, and severe vertigo, with attacks of nausea. She was unable to walk alone, and never ventured out without being accompanied by another person. After the injury she was unconscious for over three weeks. At that time some attempt had been made to remove the bullet through the external auditory meatus, but the manipulation caused such dizziness that further treatment was discontinued.

When the patient came under Dr. Lederman's care the facial paralysis, vertigo, and deafness still persisted. On closing the eyes in the erect position the woman fell toward the affected (left) side. There was a purulent discharge from the left ear, and a fibrous growth filled the external auditory canal, being attached to the internal wall of the middle ear. After its removal, the bullet could be seen in position, surrounded by some osseous deposit. It was impossible to move the foreign body through the canal, so a radical operation was performed the following day. The bullet was found imbedded in the inner wall of the middle ear, causing pressure

over the horizontal semicircular and facial canals. The lead had to be chiselled away, as a bony framework held the bullet in position. Seventy grains of lead were collected after the operation.

On the fifth day following the surgical treatment the patient was able to sit up in a chair and the dizziness was considerably improved. In two weeks she was able to walk quite well without support, something she had not accomplished in three years. At this time the ordinary speaking voice was plainly heard with the good ear closed. Before the operation only a loud voice could be faintly heard in the affected ear. It was interesting to note that the facial paralysis of three years' duration was slowly improving without additional treatment.

DR. RICHARDS had nothing to add to the discussion, excepting to call attention to the interesting phenomenon illustrated by the case—that waves of sound affect not only the acoustic but the non-acoustic labyrinth also; and the marked degree to which equilibration may be influenced through this source (when the labyrinth is in a condition of irritability) is well shown.

DR. DUEL said Weber's test showed that the patient lateralized to the affected side, as would be the case where the cochlear portion of the labyrinth was not involved.

Large Mastoid Sequestrum.

DR. W. C. MCFARLAND presented a large mastoid sequestrum, which was removed last March from a boy 8 years of age, who had had scarlet fever four months previously. At the time of operation he had a large subperiosteal abscess. The whole mastoid cortex was found detached and bathed in pus. It was removed in two pieces. Half an inch down in the mastoid, about the region of the semicircular canals, was a small sequestrum, which on removal left the dura of the middle fossa and of the cerebellum uncovered. The small specimen, taken from the depth of the mastoid, had been decalcified to determine whether any of the labyrinth was involved.

Sequestrum from Mastoid Antrum.

DR. MYLES presented a sequestrum taken from the mastoid antrum, measuring 20 by 15 by 10 mm. He saw the patient, a man, 45 years, for the first time two weeks ago. The case

was a very interesting one. Patient gave a history of a discharge from the left ear since last June. He had had marked vertigo for some time. He walked with a very peculiar gait—one foot would go over the other—and he could hardly get about without assistance. There was a brawny feeling over the mastoid, and a quantity of pus flowed from the middle ear and attic. The cortex of the mastoid was removed, together with large masses of granulations, which were sarcomatous in appearance. These granulations appeared rich in vitality. There was a decided pulsation of the entire mass, apparently transmitted from the brain beneath. The inner mastoid plate was absent over an extensive area, and within the antrum this sequestrum was found. There was carious bone in the region of the semicircular canals, and, thinking there might be a specific tubercular or sarcomatous element in the case, and knowing how nature throws off a gummatous or tubercular process, the curetting in that region had been conducted with great conservatism. The cavity measused one and five-eighths inches in depth from the skin, upward and inward. The only way to account for this was that the pressure from the contents of the cavity had become so great as to push the cranial contents upward.

The symptoms of dizziness and disturbed locomotion disappeared practically at once after all necrotic tissue had been removed, and the patient had no untoward symptoms. One or two necrotic spicules of bone have since been removed, and the cavity seems to be granulating properly. The patient is gaining in weight, his pulse is good, and he is improved in every way. The microscopical examinations were negative. The progress of the case is being watched with a great deal of interest. It has been deemed advisable to keep the wound wide open, with a view to possible developments requiring a second operation. The further developments in the case will be reported later.

Large Mastoid Sequestrum.

DR. JOHN B. RAE presented a large sequestrum, removed from the mastoid of a little boy of 7 years, who was admitted to the New York Eye and Ear Infirmary on June 28th, 1904. He was suffering from a right-sided chronic purulent otitis media, and presented, in addition, a very large subperiosteal

abscess. Over the lower part of the mastoid process could be seen the scar of a small incision, quite healed, and presumably the evidence of a former Wilde operation. On investigation of the abscess cavity a very large cortical perforation was discovered high up over the antrum. The interior of the mastoid was in great part occupied by granulation tissue, and lying within, or loosely connected with this mass of granulation, so that they were easily removed by means of a thumb forceps, were the two sequestra which the doctor presented. The larger included the bony meatus, and the smaller a portion of the bone forming the glenoid fossa. The mastoid having been thoroughly cleaned out, the meatus was enlarged by incision into the concha and removal of cartilage, and the post-auricular wound partially closed by sutures above and below.

Two weeks later the cavity was skin-grafted and the post-auricular incision closed by suture, except at the very lowest corner.

As far as could be determined, the loss of bone caused no inconvenience to the child in eating or in any other way.

On discharge, six weeks after operation, the house surgeon's notes read: "Wound is clean, except for slight serous discharge. Case ran no temperature above 99°."

Dr. Lewis said that a number of years ago a little girl, 8 to 10 years of age, came to the infirmary, with marked discharge from the ear and with a facial paralysis. Upon operation he found the middle ear filled with large masses of granulation, and deep in the granulation a movable mass of bone. After careful manipulation, requiring some little time, this was dislodged and found to be a sequestrum, containing a portion of the cochlea and of the carotid canal.

Paper: Two Tests for the Diagnosis of Ossicular Ankylosis.

By E. P. Fowler, M. D.

Dr. Kopetzky said that in his opinion the test shown by Dr. Fowler was quite dissimilar to the Gelle test. The latter depended entirely upon bone conduction. The test shown this evening does not depend upon bone conduction, but rather upon the conduction of the vibrations of the fork through a

column of air condensed in the cup by the increase of air pressure produced through the action of the hand bulb. According to physical laws, sound will be increased in intensity when the medium through which it is transmitted is increased in density. Therefore it follows that an increase in loudness is to be expected when the air through which the sound is transmitted is made more dense. This constitutes a factor of possible error in the calculation of the results obtained by Dr. Fowler. It will be interesting to note just how far the results obtained from the Fowler test will coincide with those obtained from the Gelle test. Such evidence is as yet not at hand, and until it is given no conclusion can be reached as to the practical value of the Fowler test.

DR. DENCH said that the manometric observations showed that pressure on the round window was three times as efficacious in increasing labyrinthine pressure as pressure upon the oval window. He thought that this was one reason why Gelle's test could not be depended upon in making a differential diagnosis of ankylosis of the stapes. Of course, if the stapes is immovable, pressure on the round window would cause very little difference in labyrinthine tension, owing to the fact that fluids are practically incompressible.

DR. DENCH thought the work done by Dr. Fowler was certainly in the right direction, that it was of great value, and the doctor deserved much credit for his painstaking labors. The speaker was extremely skeptical, however, as to the practical value of his experiment as a means of making a diagnosis of stapes ankylosis.

DR. FOWLER, in closing the discussion, said that in so far as the density of the air in the apparatus is concerned, he understood that the density of the air has no effect unless it is the air in which the sound is generated. In this apparatus the sound is generated partly inside the apparatus, as is proved by the fact that the results obtained with it are similar to those obtained with the apparatus containing an internally mounted fork.

The explanation of the fact that the stronger pressure on the head diminished the sound is that it stops the cup from vibrating so strongly, but these changes, if listened to, are so distinct from the changes brought about by compression that they are easily perceived to be not of the same character.

The tests do not depend upon the pressure of the apparatus against the side of the head. It takes so slight an air pressure to bring out the tests—only a fraction of a millimeter—that this is not enough to cause a great diminution of sound through the variations in intensity due wholly to the altered vibration or other peculiarities of the apparatus. Although the density and elasticity of the air in the cup increase with the pressure, suction has exactly the opposite effect, and yet the sound is diminished as before. The increased density also slightly increases the temperature, and condensation would do the opposite, but changes due to these factors are so slight that they would not affect the accuracy of the experiments.

A Case of Cavernous Sinus Thrombosis Following an Acute Tonsillitis—Death—Report of Autopsy Findings.

Dr. Robert Lewis, Jr., reported a case of cavernous sinus thrombosis following acute tonsillitis, as follows: On the evening of July 21st I was called to St. Francis Hospital to see a boy, aged 12 years, with the following medical history:

On July 17th the boy complained of sore throat and stiffness of the left side of the neck. That evening he had a chill. On the afternoon of the fourth day following he was admitted to St. Francis Hospital. At that time he complained of pain in the left side of the neck, pain in the left eye and in the right side of his chest. His temperature was 102½° F.

When I saw him at 10 p. m. of that day his temperature was 104° F. Pulse 96. Respiration 30. There was present a chemosis of the conjunctiva of the left eye and eyelid. No strabismus was present, but there was a marked exophthalmus and a paralysis of the left side of the face. A purulent exudate covered the left tonsil. The ears were normal. There was no headache and no vomiting. The pain in the left eye was very severe. The patient talked rationally when spoken to, but was somewhat drowsy. On attempting to walk he staggered and would have fallen had he not been supported. The reflexes were somewhat exaggerated.

The fundus of the eye was examined the next day by Dr. Lynch and found to be normal. Dr. Donavan found a pneumonia at the base of the right lung. On July 22nd, at 8 a. m., his temperature was 105 4/5° F. Pulse 136. Respira-

tion 24. At 6 p. m. of the same day his temperature was 106 2/5° F. Pulse 150. Respiration 28. Patient died at 8:15 p. m.

AUTOPSY BY DR. JOHN LARKIN.

Liver—Pale, anemic, flabby, no abscess. Adhesions between upper border of transverse colon, gall bladder and lower surface of liver.

Right Lung—Upper lobe consolidated, covered with suppurative exudate, adhesions between visceral and lateral pleura, multiple septic infarcts in lung.

Left Lung—Lower lobe confluent lobular pneumonia and hypostatic pneumonia; rest of lung aerated.

Heart—No valvular lesion.

Thymus—Persistent.

Left Tonsil—Moderately enlarged and seat of active suppurative inflammation; no diffuse cellulitis around tonsil.

Right Tonsil—Normal.

Left Internal Jugular Vein—Not dilated, but contained postmortem thrombus, which was removed without difficulty. Antemortem condition normal.

Muscles of Left Side of Neck and Left Submaxillary Gland—Cellular infiltration.

Meninges—O. K.

Brain—No pathologic changes.

Left Cavernous Sinus—Contained broken-down thrombus and pus.

Right Cavernous Sinus—Filled with pus secondary to infection of left sinus.

Left Inferior Petrosal Sius—Filled with thrombus.

Orbital Veins—Thrombosed. Orbital cellulitis.

Our hands are always tied in the presence of these always fatal cases. The possibility of developing an operative technic that may be the means of saving these hopeless cases is very questionable, on account of the inaccessibility of the sinus involved. The route which is followed in the removal of the Gasserian ganglion has been attempted on two occasions, once by Dwight and Germain, and again by Hartley and Knapp. Langworthy suggests the following route, which he has done only on the cadaver: "After elongating the usual frontal sinus incision downward along the nasal bone and re-

tracting the eye out of the field, the inner wall of the orbit is removed over a considerable area, together with the nasal bone on that side. The entire structures within the nasal fossa, ethmoid labyrinth and turbinates are then curetted out. This at once brings one down on the anterior surface of the body of the sphenoid, with the opening of the sphenoidal sinus in plain view. The anterior wall of the sphenoidal sinus is next to follow and also the external or lateral wall, against which rests the cavernous sinus. From this point one can do considerable on the cadaver with a prick of the knife and a properly curved blunt dissector. If unsuccessful in opening the cavernous sinus, the external wound is easily closed, the eye remains uninjured, and nothing is lost by the attempt."*

I think the fact that, notwithstanding the thrombosis of the orbital veins, as well as of the cavernous sinuses, the fundi of the eyes were found to be normal should be emphasized.

DR. DENCH said that he had approached the cavernous sinus by the Gasserian route in making some experiments on the cadaver, and had been very much impressed with the ease with which the sinus might be exposed. He mentioned the fact that Dr. Hartley some years ago was able to remove a small clot from the circular sinus. This operation is certainly more difficult than the removal of a clot from the cavernous sinus. He had had no experience with the Langworthy operation, either on the cadaver or on the living subject, but thought that this method of approaching the cavernous sinus presented many difficulties.

DR. LEWIS said that his reason for presenting the report was that the path of infection from the tonsil to the cavernous sinus is rather rare.

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*Laryngoscope, July, 1906.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOLOGY.

Regular Meeting, December 11,, 1908.

ARTHUR B. DUEL, M. D., CHAIRMAN.

A Case of Acute Mastoiditis, Complicated by Sinus Thrombosis, Extradural Abscess, Encephalitis and Meningitis.

DR. SEYMOUR OPPENHEIMER first saw the patient, a girl of 12, on March 3, 1908. For two weeks previously she had had a slight cold, but not enough to keep her from school. During this period the mother noticed a slight discharge from the ear. Two days prior to coming under observation she complained of pain in the left ear, which became more pronounced during the day. The following day the temperature varied between 102° and 103°, the pain in the ear was less, and there was some discharge. The patient was in bed and comfortable. During the night she became irritable and complained of much pain. The day of examination she was very irritable and restless, and complained of headache. Discharge from the ear profuse. Temperature 104°. At 10 a. m. she had a pronounced chill, and gradually sank into coma. At 11 she was completely unconscious. At 1 p. m. Dr. Oppenheimer saw her in consultation. Temperature then 106.5°. The patient was comatose and presented all the evidences of severe acute mastoiditis, and the physical condition indicative of intracranial involvement. No convulsions had been noticed. Slight generalized spasticity of the extremities, and double Kernig and McEwan's signs were present. She was removed to the private pavilion of Mt. Sinai Hospital and immediately operated upon.

The usual curvilinear incision was made through the skin and periosteum over the mastoid process. The entire mastoid process was involved in an acute inflammatory process of severe type. The bone was of a greenish-yellow hue; cells

infiltrated with thick greenish fluid. Culture showed streptococci. The entire mastoid process was removed, the extensively necrosed bone being removed en masse. The sigmoid sinus plate was necrotic, and its removal exposed the sinus wall. The vessel was contracted and appeared to be thrombosed. The mastoid emissary vein was exposed and traced to its ending in the sinus; it also was thrombosed. On removing the cells over the mastoid antrum, a fistulous tract was seen through the roof, through which pus escaped. This opening was enlarged, and about two drams of greenish pus under great tension were liberated. The dura was further exposed anteriorly by removing a large plate of bone from the squamous plate of the temporal bone. The antral and tympanic roof were also removed. The dura was then seen to be markedly congested, bluish black, and bulged pronouncedly. It was freely incised. The brain was much congested, having a friable appearance over a large area, with exudation. The pia arachnoid was greatly congested. Fresh adhesions between the pia arachnoid and dura were bluntly separated, and a gauze drain was inserted into the subdural space. The brain was pulsating, bulging, and markedly softened. The vertical limb of the sigmoid sinus was then compressed above and below and was incised. A fresh reddish brown clot presented, after which there was an escape of blood. Free hemorrhage was established from the distal and proximal ends of the vessel. The blood culture showed four colonies of streptococci to each ccm.; polymorphonuclear count 90%; white blood count 31,000.

On the day after the operation the patient was in a state of wild delirium, and lumbar puncture was resorted to for relief of the cranial pressure. The cerebrospinal fluid escaped under great tension and was cloudy, but bacteriologically negative. Polymorphonuclear count 25%; albumin increased. Prior to the receipt of the laboratory report on the cerebrospinal fluid, antistreptococcic fluid had been injected into the spinal canal. The next day the patient was still delirious and was aroused with difficulty. Lumbar puncture was followed by a flow of clear fluid still under great pressure. Blood culture now sterile. The next day the patient was somewhat rational. From this time the patient gradually improved until the 18th of March, when she again became extremely irritable

and sank into a stuporous state. Her temperature rose abruptly to 106°; polynuclear count 84%. Lumbar puncture resulted in the escape of a large quantity of turbid fluid under great pressure. Smears and culture of fluid negative. Polymorphonuclear count 5%; mononuclears 95%. During the next day the patient's condition showed no improvement, and she was very noisy and unmanageable. On the 20th, the temperature came down to 101°, and she seemed markedly improved. The condition of the last few days was attributed to a local encephalitis rather than to a general cerebral process. From this time her improvement was gradual and uninterrupted, and ended in complete recovery.

DR. CHAMBERS said that the doctor, as well as the family, should be congratulated on the fortunate outcome in so remarkable a case.

A Case of Sinus Thrombosis.

DR. E. GRUENING. Boy, aged 10, admitted to Mt. Sinai Hospital March, 1908, with a temperature of 105° and symptoms of sinus thrombosis. A blood culture was taken on the operating table and the streptococcus found in the blood. In the operation the sinus plate was completely removed and the jugular bulb exposed according to Grunert's method. It was not difficult to do this. The transverse process of the first cervical vertebra was not in the way, as in the first case reported by Grunert. The internal jugular vein was ligated and exsected. The clots were removed from the sigmoid and lateral sinuses.

The next day the temperature rose to 107° and within a few hours fell to 95°, a drop of 12°. It remained at 95° four hours and then rose to 106°. A blood culture taken 24 hours after the operation was negative.

A few days later the streptococcus reappeared in the blood. Mastoiditis was found on the right side and a disintegrated clot in the left lateral sinus. The necessary operations performed. Then he had a number of abscesses in different parts of the body, viz.: in the muscles of the thigh, in the muscles of the arms, in the perineum, in the suprapubic region and in the right knee joint. Dr. Howard Lilienthal aspirated and immobilized the knee, and although eight ounces of

streptococcic pus were withdrawn from the knee the boy has a perfect joint.

Paper: Sinus Thrombosis and Streptococcemia.*

By Emil Gruening, M. D.

DISCUSSION.

Dr. Duel said that Dr. Gruening was to be congratulated upon presenting so remarkable a series of very severe cases, with such a very low mortality. They represented a triumph of modern surgery.

The early recognition of streptococcemia by means of blood culture would undoubtedly lead to earlier operation and, consequently, more gratifying results in many doubtful cases of septic sinus thrombosis.

Dr. Libman: I have but little to add to what I said at the meeting of the section last year. When a patient has recurrent chills and temperatures, and streptococci are found in the blood, even if there is no evidence whatsoever of otitis media, recent or old, it is essential, when no other primary focus can be found, to expose the mastoid and the sinus. The other conditions in which repeated chills with fever occur, and in which streptococci are found in the blood, are infective thromboses of the pelvic veins arising in the male or female genito-urinary tract, infective thromboses of the cerebral sinuses or of the veins of the extremities, and in infective endocarditis. In cases of infective thromboses of the extremities there is local evidence of the disease. In infective thromboses of the pelvic veins there is always a history of a primary focus. The infective thromboses of the cerebral sinuses, excluding the lateral, which is under discussion now, generally have local symptoms and a demonstrable etiologic factor. When the veins of the portal system are involved, although there may be repeated chills and fever, there are generally no bacteria in the blood unless cholangitis is present, and in that case clinical symptoms are present. There are cases with repeated chills and fever in which there is an infection of the veins leading from the throat, but in all such cases the clinical features

*This paper, elaborated and more fully discussed, was read at the meeting following.

are distinct. This shows how easy it is in many cases to arrive by exclusion at the possible source of the infection, and how important a clew a slight otitis media may give. The cases of acute infective endocarditis are, as a rule, not difficult to diagnose. When it is doubtful whether an acute endocarditis is present or not, it will be found wiser, in the presence of any evidences of ear trouble, recent or old, to make an exploration of the sinus.

A point of great interest has been brought out by this work on sinus thrombosis. The work has shown the rapidity with which bacteria are gotten rid of by the body fluids. When the jugular vein is tied off and there have been streptococci in the blood, the organisms disappear from the blood quite rapidly. In one case we found the blood free eight hours after operation. These observations have the demonstrative value of an experiment and show the great difference that exists between tissue immunity and blood immunity.

DR. LEDERMAN asked Dr. Libman in a case of sinus thrombosis which has existed for some time how long he would expect to find bacteria in the blood, provided no operation was done? In a cases of sinus thrombosis which has existed some time, would or would not the blood take care of the bacteria, even after the clot had become infected? In a case which he had presented at the last meeting, where symptoms of infected sinus thrombosis had existed ten days before the speaker had seen the patient, and operated at once, at no time when the blood was examined were any bacteria found in the blood. There were lung complications, breaking down in the neck, with involvement of the knee joint without suppuration.

DR. LIBMAN: Dr. Lederman's question is a very pertinent one, although the answer cannot be made categorically. In early cases of sinus thrombosis it appears that the blood cultures are practically always positive. This is probably so because the blood is in part or entirely parietal and bacteria are washed off by the blood stream. Of course, if there were an aseptic thrombosis present, there could not be any bacteria in the blood. There is also a possibility that an infective clot might have below it a non-infective clot. In the next place, the blood might acquire such a high bactericidal property in the course of a short time that the bacteria would be killed off rapidly.

The main reason, however, why bacteria are at times not present in cases of longer standing is that in these cases pieces of clot are broken off, which are carried to the lungs and are deposited there, the bacteria traveling no further. There may be extensive metastases in the lungs and no bacteria present in the peripheral circulation. We are dealing here with what might be called a partial or incomplete bacteriemia.

Dr. Harris said that he was not able to contribute anything of value to the discussion, for he had no personal experiences in such blood work as Dr. Gruening had reported, but he wished to express his appreciation of the paper. Through long years of experience he has come to feel that anything which Dr. Gruening may contribute is well worthy of attention. This remarkable series of cases with so low a mortality is a most important showing, and he was particularly impressed with the manner in which the histories were stated, showing how thoroughly they were studied. He had always been impressed with the importance of blood examination, and if this paper has the wide circulation which it deserves it will doubtless have the effect of causing more blood examinations to be made. This ought to be a part of the routine work in all hospitals. Supplemented with what Dr. Libman had said, it has established itself as an important aid in the diagnosis of sinus thrombosis.

Dr. Seymour Oppenheimer said that he had had the privilege of observing with Dr. Gruening many of the cases of sinus thrombosis with bacteriemia which he had referred to this evening, and wished to express himself as thoroughly in accord with the views contained in the paper. While he did not think that otologists should depend upon the laboratory to establish the diagnosis of sinus thrombosis, yet he had come to regard blood culture examinations as a definite part of the examination. In Dr. Gruening's service at Mt. Sinai Hospital it has been the practice in many cases to have a blood culture taken at the time of the mastoid operation. This has demonstrated almost conclusively that mastoidal disease per se does not produce a bacteriemia. Therefore the value of a positive blood culture is self-evident. In view of the number of atypical cases of thrombosis which have come under observation, in which clinical signs did not allow of the establishment of a definite diagnosis, the value of this work cannot be over-

estimated. For example, in one of the first cases reported by Dr. Gruening, the patient was admitted to the hospital in a state of coma. The general physical examination was negative, chronic suppurative otitis was noticed, but no mastoidal symptoms; blood culture positive—diagnosis of sinus thrombosis made and proven at operation.

Another point: While he recognizes, after exposing the sigmoid sinus, the usual operatively construed indications for proceeding or not proceeding further and ligating the jugular, yet he feels that in the positive blood culture we have a much more definite and accurate working basis. For example, a mastoid operation having been performed and evidences of sinus thrombosis subsequently develop or are present at the time of the primary operation—the sinus is operated, blood culture found positive and remains positive even in the presence of no evidence of jugular involvement. The logical deduction is that the general systemic invasion is still going on; that the jugular is the main channel through which this invasion can with reasonable certainty be said to be the case, in view of the constant conversion of positive into negative cultures after jugular ligation.

In the last case which he had observed, blood culture eight hours after operation on the jugular gave a negative result, but unfortunately in this case metastases in lungs and joints came several days after the blood was free from bacteria, due to bacteria lodged earlier. Dr. Libman has called attention to the fact that all the foci in which bacteria have been deposited do not show activity at once.

Dr. Oppenheimer then referred to two cases in a series of his own; the first a young woman upon whom a mastoid operation was performed, followed by operation upon the sigmoid sinus. This was the first case in which he had any experience with the blood culture taken after a sinus operation. It showed a bacteriemia of four or five colonies of bacteria to each cc. Subsequent cultures showed increasing colonies up to sixty. The clinical signs were not sufficient to justify opening the mastoid. The case was atypical and did not suggest the presence of a septic thrombus in the jugular vein. Subsequently the patient developed a chill and high temperature, and thereupon the jugular vein was ligated and a thrombus found.

In another case, a mastoid operation was performed upon a

young man. Three weeks after the operation, although he was running a practically normal temperature, never above 100°, yet he was not looking right. He had frontal headache, and looked septic, although the temperature did not suggest it. A blood culture was taken and showed 230 colonies of the streptococci to each cc. of blood. The jugular vein was ligated and found to be thrombosed. One portion of the thrombus was well organized and the other had broken down.

Both of these patients made excellent recoveries, and in both the diagnosis was made by the blood culture and not by the clinical signs.

DR. CHAMBERS said that Dr. Oppenheimer had spoken of using antistreptococcus serum, and he would like to know how many times it was employed.

Dr. Gruening, in his report, makes no record of its use. From the report he gathered that Dr. Gruening feels that one must be satisfied that there is no clot left in the sinus or in the jugular vein, but one must go down to the clavicle, and to the bulb, and to the lateral sinus, as necessary, until the blood flows freely from both ends of the opening in the vein. So he supposes Dr. Gruening does not use antistreptococcus serum.

DR. OPPENHEIMER, replying to Dr. Chambers, said that one injection of antistreptococcus serum was made in the cerebrospinal canal, and it did not modify the temperature.

In view of the fact that 90 per cent of the cases observed at Mt. Sinai, in which the operation had been performed on the sigmoid sinus, and in which blood culture had been positive, the jugular vein had to be subsequently ligated, he would like to know whether Dr. Gruening would not be inclined to go a step further and say that the presence of a positive blood culture would not be an indication for the primary ligation of the jugular.

DR. LEWIS inquired whether Dr. Gruening had done more than one Grunert operation on the jugular bulb. It seems to be a very difficult operation, and he himself had had no experience with it. He would like to know also if other members of the section had had experience with it.

DR. GRUENING said that he generally ties the jugular in thrombosis of the lateral sinus and does so before the removal of the thrombus. He had performed the Grunert operation three times in children, and found no particular difficulty. It may not be so easy in the adult.

Sequestrum of Labyrinth—History.

By Frank T. Hopkins, M. D.

DISCUSSION.

Dr. Gerhard H. Cocks asked Dr. Hopkins to which test he referred when he used the term experimental nystagmus. Did he mean caloric nystagmus (hot and cold water), or did he refer to Barany's compression and aspiration nystagmus?

Dr. Hopkins replied that he referred to caloric nystagmus —produced by hot or cold water.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOLOGY.

Transactions of the Meeting, January 8, 1909.

ROBERT LEWIS, M. D., CHAIRMAN.

A New Method for Inflating the Eustachian Tube and Middle Ear.*

BY EDMUND PRICE FOWLER, M. D.

NEW YORK.

Necrosis of the Cochlea. Report and Analysis of a Case.†

By ALFRED MICHAELIS, M. D.,

NEW YORK.

DISCUSSION.

DR. FOWLER asked if any of the heat and cold tests produced nystagmus.

DR. MICHAELS replied that he had made no nystagmus tests, nor heat and cold tests. He had not noticed any nystagmus.

DR. KERRISON said that there could be no doubt that the tones which appeared to have been heard in this case by the ear from which the labyrinth had been removed, had in reality been heard by the sound ear—this in spite of the closure of the meatus by the finger. This seems to be the correct conclusion from the tones which the patient did hear. Take, for example, any patient with a moderate grade of tympanic deafness or impairment, and ask him to close both ears with a finger pressed in each meatus. It will be found that the lower tones, i. e., 18 d. v. to 128 d. v., will not be heard, while it may be quite impossible to exclude the upper tones, e. g., 1024 d. v.—2048 d. v. Now, it is just these higher musical tones which the patient is reported to have heard, and it seems clear

*See page 852.

†See page 511, September Annals.

that they must have been heard by the sound ear, and not by the ear in which the labyrinth had been destroyed.

DR. LEWIS said that the case was a very interesting one, taking into consideration the conservative treatment which had brought about the desired results.

DR. KENEFICK said that the point mentioned by Dr. Lewis was the one which he wished to emphasize—the conservative or expectant treatment in certain cases of chronic suppuration, with granulation and polypi present. In two cases at the New York Eye and Ear Infirmary—cases of long-continued suppuration, in which it seemed best to try and relieve the situation by conservative treatment—they began treatment, not by removing the polypi in the first place, for the canal was so swollen that nothing could be done that way, but by cleansing the ear, gradually reducing the swelling, and later syringing, removed the malleus and incus. It now appeared probable that the patient would escape the radical operation. In the second case, which is still under care at the Infirmary, the granulation tissue was removed in the clinic, and the patient was kept in the hospital for observation. She had slight attacks of vertigo and nausea, and the day before a small piece of bone was syringed from the ear. The nurse in charge was inexperienced, and the bone was thrown away, but she spoke of it as a very small spicule, evidently an ossicle. We frequently see in the clinic cases in which the canal appears to be occluded and completely epidermatized at the fundus, cases in which no operation has ever been done, and the patient will give a history of very long-continued suppuration. It would seem that in these cases which have had no treatment, such as would be considered proper to-day, nature proceeds along these lines, finally expelling the ossicular sequestrum, and the fundus becoming epidermatized, the case is closed. That is the ideal radical operation which we try to produce artificially, but we see very few ossiculectomies or radicals which close up as beautifully as the cases which were never operated upon.

DR. MICHAELIS said that the discovery of this case was largely accidental,, for if he had not found the sequestrum it would have been overlooked. These sequestra frequently elude discovery. He is observing a young man of 17 or 18 years now, in the expectation of getting a sequestrum. The diagnosis of labyrinthine necrosis is absolutely clear. There

is facial paralysis, a perforation through Shrapnells', with exuberant granulations protruding, and several severe attacks of vertigo. The granulations were cleared out as well as possible, securing better drainage, with the result that the patient improved. The facial paralysis improved very much, and with the exception of a little twitching of the muscles the patient is apparently all right.

Bezold says that he has noticed that sequestra were often found beneath granulations which were teat-like and partially perforated. This was true of the case he had just spoken of. During the treatment he had noticed a teat-like protrusion on the membrana tympani, a little distance from the perforation. This gradually became perforated, and a drop of pus would come through. Then it would close, and a week or two later it would go through the same cycle. It seems probable that there is a sequestrum beneath it, trying to get out.

The patient is seen once a week and is carefully watched, and all danger symptoms are explained to him, by which he should be guided in case they arise. Much can be done without resorting to the knife, and many of these cases can be saved from the radical operation.

Paper: A Plastic Mastoid Operation—A New Method of Operating in Acute Mastoiditis.*

By Frank T. Hopkins, M. D.

DISCUSSION.

Dr. Kenefick said that he was much interested in some of Dr. Hopkins' cases while under treatment, and while the immediate closure of the posterior wound is a very attractive and most desirable procedure, still there are certain cases where the bone wound is especially extensive and irregular, in which the closure of the posterior flaps would make it very difficult for one unfamiliar with the wound to carry out the subsequent treatment. In other words, if he himself performed this operation, he would wish to carry it through the healing process himself, and not entrust the subsequent care of the case to any one who was not familiar with the wound. From a cosmetic point of view, in cases where that would be of great

*See page 864.

importance, as in actors or actresses, the operation might serve a very excellent purpose. He would like to try it in some cases, but in general could not help feeling that he preferred to see the open wound and watch its granulation from every part.

Dr. Hopkins, replying to an inquiry from Dr. Lewis as to whether there was not quite a sulcus in the anterior wall of the posterior portion of the canal, as in a radical mastoid operation, said that he had such a sulcus in one of the cases reported, but in the others which are still under observation there was not much of a sulcus. This, however, he could determine more definitely later, some time after the operation, when the chances of retraction are greater. One patient now has a good deal of sulcus which he did not have soon after the operation. The other cases have not yet shown this, but they may develop it later.

Dr. Rae could not admit Dr. Hopkins had proved his point by the cases he had presented, whatever might be the results of later experience. There was no gain in the time of healing, nor were the posterior scars better than the average treated by older methods. His cases had, in addition, the deformity of the meatus, due to the formation of the flap. Experience with rapid methods of closure, as opposed to the open method, has already shown that the most grave complications may arise and be unsuspected for some time. This criticism can certainly be applied to the method advocated by Dr. Hopkins, and while no method can be entirely free from the risk of complications, the proportion of their occurrence should be less, and their detection earlier, when the old method of treating the post-auricular wound as an open one is followed. The one positive advantage of the method—frequently of great importance where a living for the patient and those dependent upon him must be considered—is the early removal of the unsightly dressing.

Dr. Lewis thought that in these cases one would have somewhat the same conditions arise as in the radical mastoid operation, where there is always a deep sulcus in the excavated mastoid process, where cerumen and broken-down epithelial cells often collect, and which have to be removed with more or less frequency. The same condition is likely to be present here. That would be more of a detriment than to

have the wound take a little longer to heal, and when healed be without any such deformity in the meatus. He agreed with what Dr. Rea had said regarding the dangers resulting from such closure of the wound, especially when the sinus or dura was exposed. He could not see that the time of healing had been shortened to any great extent. One case had healed in five weeks, but the others took eight weeks, the ordinary time of healing under the usual method.

DR. HOPKINS, replying to the remarks of the chairman as to the length of time required for the healing, said, that although it had been shortened to five weeks in the last case, and in other cases could be made much shorter, for each succeeding case healed in a shorter time than the previous one. The actual length of time required for the healing of a case, however, was only a part of the benefit which he claimed for the operation. The most important benefit was the closure of the posterior wound, which gave the patient the opportunity to go about his business without the bandage on the head, which is so great a detriment with the ordinary mastoid operation, where it cannot be removed for many weeks. It is certainly a great advantage to a majority of patients to go about as in the natural order of things and not appear so long in the surgeon's hands.

NEW YORK OTOLOGICAL SOCIETY.

DR. J. E. SHEPPARD, PRESIDENT.

Meeting November 28, 1908.

DR. GRUENING reported a case of

Double Lobule of the Ear, One Lateral and One Median.

He also reported a case of

Serous Meningitis Secondary to Mastoiditis.

The patient was admitted to the hospital with a temperature of 105°, in a semi-comatose condition. The leucocyte count was high. A lumbar puncture was made, showing a clear fluid. The next day the patient was decidedly better. A mastoid operation was performed, and there was a prompt recovery.

DISCUSSION.

DR. MCKERNON said that he had recently seen a case of serous meningitis, following the mastoid operation, where an attempt had been made to close the wound by the blood clot. The wound itself, when seen by him, looked excellent. The patient, however, complained of intense pain in the head. There was a leucocyte count of 22,000, and a polynuclear percentage of 92 per cent. The wound was reopened and necrotic bone discovered. That night the patient had high temperature and was unconscious. A lumbar puncture was made and 60 cc. of clear fluid drawn off. In eighteen days nine lumbar punctures were made—all showing sterile fluid. Patient made good recovery. Dr. McKernon thinks that the lumbar puncture saved the patient's life.

DR. ROBERT LEWIS, JR., reported a case of

Cavernous Sinus Thrombosis

which he had recently seen. The patient, a boy, when seen by Dr. Lewis had been suffering for four days from an attack of acute tonsillitis. There was an exophthalmus of the left eye, a chemosis of the conjunctiva of the left eye and the left eyelids; the fundus of the eye was normal; a

pneumonia of the base of the right lung was present. There was no strabismus; no headache, and no vomiting. The patient was drowsy, but rational when spoken to; when attempting to walk he would have fallen had he not been supported. The temperature was 104° F. The ears were normal. The boy died twenty-four hours later. A postmortem showed, besides pneumonia, a thrombosis of the cavernous sinuses of the left inferior petrosal sinus and of the left orbital veins; the lateral sinus and the jugular vein were normal. The infection evidently spread from the tonsillar structures to the sinuses through the pterygoid plexus of the veins.

DR. GRUENING spoke of a case of thrombosis of almost all the sinuses of the dura mater without optic neuritis. This sems to corroborate the view that optic neuritis is due to an increase of the intracranial pressure and not to the obstruction of the veins alone.

DR. MCKERNON spoke of a case of cavernous sinus thrombosis in a child of six years. An operation for adenoids had been performed by a physician in the country six days before. There was a characteristic swelling of the eyelids. Death took place in four days. In this case there was a thrombosis of both cavernous sinuses.

DR. MCKERNON reported having seen in consultation three cases of

Sinus Thrombosis Following the Simple Mastoid Operation, Where an Attempt Had Been Made to Induce Healing by the Primary Blood Clot Method.

Two of the cases died. In the third case the vein was ligated. Complications manifested themselves on the 6th, 12th and 14th days, respectively, in the three cases. All three were seen within the past eight months. As a result of these and other cases reported, Dr. McKernon was strongly of the opinion that this method of promoting healing was not sound surgery.

DISCUSSION.

DR. GRUENING repeated the views he had previously expressed in condemnation of the method, stating that his objections had been a priori, while Dr. McKernon's were a posteriori.

DR. DENCH agreed with the views expressed by Dr. McKer-

non, although he himself had done three cases successfully by this method.

Dr. Bryant stated that he did not believe in completely closing the wound, but in leaving a small opening for the insertion of a drain. In this way he had had no bad results; and in 80 to 90 per cent of his cases the clot had not broken down sufficiently to interfere with the course of healing. He laid stress upon as complete an obliteration of the disease processes as possible, and applying a skin flap into the wound. He regarded complete healing within 14 days as a fairly satisfactory results. Otorrhea does not occur.

Dr. Rae emphasized the fact that the method pursued by Dr. Bryant was not in reality a healing by the blood clot, and only differed from the usual method pursued in a more complete closure of the wound.

Dr. Berens said that he had seen a number of these cases, and spoke especially of the case of a child where he had had a most satisfactory result, the patient being well in two weeks. The discharge, however, recurred through the ear, and persisted during the summer, compelling him this fall to do a radical operation. At this time a large pus sac was discovered beneath the natural-looking soft parts, and in spite of the thorough primary operation granulations were found in the attic, and necrosis in the region of the semicircular canals.

Dr. Duel had attempted healing by the b'ood clot method in a number of cases. At first he had good results superficially. Then one case in this number which had healed promptly developed a sinus thrombosis and died. He believed that the method was not based on sound surgical principles, and in the future should be satisfied with slower healing with the least possible opportunity for disaster. He called attention to the value of the usual method of drainage of the attic by gauze (which in the case of acute mastoiditis is usually full of granulations). Rapid subsidence of the inflammation in the middle ear, which results from good posterior drainage, conserves the hearing functions very materially.

Dr. Haskin spoke of a case in his own practice of prompt healing where this method had been pursued. In nine months, however, pain and discharge compelled a secondary operation, and a sinus was discovered extending to the bottom of the wound, from the region of the former attic. The blood clot had apparently become organized and showed new bone formation.

DR. SHEPPARD had pursued the method in only six or seven cases, in three of which he had primary union, the others having required reopening.

DR. BERENS reported a case of

Mastoiditis Complicated by Diabetes Mellitus.

in a man of 34. The percentage of sugar was not determined. When seen by Dr. Berens, there was a swelling all around the ear. The disease had lasted for six or seven weeks. There was no temperature and no pain. On account of the failure of the mastoiditis to improve, and recognizing the hazard entailed, a mastoid operation was performed by him, and a large sequestrum was removed. Its removal exposed the dura and the knee of the lateral sinus. Death 40 hours later in coma. Ether had been used by the drop method, as the anesthetic—not more than three ounces in all. Death was attributed to diabetic coma from shock rather than from the ether.

DISCUSSION.

DR. GRUENING spoke of a case of mastoiditis complicated by diabetes, with 4 per cent of sugar, acetone, and diacetic acid. Operation was performed under ether, narcosis lasting 20 minutes. Good recovery. He felt that the presence of diabetes should in no way retard operation when necessary.

DR. HASKIN spoke of mastoiditis, complicated by diabetes, where he had operated under local anesthesia—cocain 1 per cent, and adrenalin chlorid 1-1000, equal parts. A good recovery took place.

DR. COWEN referred to a case of mastoiditis complicated by diabetes where he had operated under gas and ether narcosis. The operation lasted only 25 minutes. Death followed from 48 to 72 hours later from internal stomachic hemorrhage.

DR. DENCH reported a case of

Mastoiditis, Epidural Abscess, and Sinus Thrombosis.

Three weeks previously an operation had been performed on the nose, followed by acute inflammation of the ear, for which the drum had been incised. When seen by Dr. Dench there was marked mastoid tenderness and a fusiform swelling, extending from behind the ear into the neck, indicating a Bezold perforation. There was a profuse aural discharge. A complete mastoid operation revealed an epidural abscess and

a destruction of the lower part of the lateral sinus. The swelling in the neck was found to be a mass of lymphatic glands, which were excised and the jugular vein ligated and excised. An interesting fact was that there was so little evidence of general sepsis. It was a streptococcus infection.

DISCUSSION.

DR. GRUENING had seen a similar case in a soldier. Here the mastoid cells were found to be filled with serum. There was a thrombosis of the leg. No temperature. The lateral sinus was not opened. Good recovery.

DR. MCKERNON inquired into the size of the remaining portion of the sinus. Dr. Dench replied that it was rather small.

DR. HASKIN mentioned a case of

Pulmonary Tuberculosis Complicated by Tubercular Mastoiditis and Swelling of the Neck.

Here the operation showed a large sequestrum involving the superior part of the petrosa. The healing in the mastoid wound had progressed favorably, but it was necessary later to open the swelling in the neck, which was due to enlarged glands. The lateral sinus was not involved.

DR. HASKIN recommended the hypodermic use of adrenalin chlorid underneath the periosteum of the canal after general anesthesia had been induced. In this way he had been able to greatly reduce the amount of bleeding in the radical operation for chronic suppuration.

DR. HARRIS reported a case of

Vertigo.

in a man of 45, which had persisted for over a year, which had been preceded for a short time by a tinnitus in the left ear. The onset of the vertigo followed a severe blow on the temple bone of the left side from a falling plank. This stunned him for a moment, but there was no other apparent damage. Family and personal history negative. He was a mechanic. He had been under the care of a number of good physicians, who had given him pilocarpin, strychnin, and potash, without benefit. He was first seen by Dr. Harris last August. Functional tests showed entire absence of all internal ear disease. There was prolonged Schwabach and raising of the lower tone limit in the Hartmann series of tuning forks. There was no history of previous disease of the ear.

and the drum was normal. Under these circumstances, Dr. Harris felt that there was very probably present a binding down of the ossicular chain, and under local anesthesia he removed the malleus and incus. There was satisfactory improvement for a period of three or four weeks, but at the end of that time the vertigo returned and persisted. He had never been able until recently to discover any nystagmus, but had noted this condition the day previously. The nystagmus, however, was contradictory; that is, it appeared both away from and toward the affected eye. The caloric test was also unsatisfactory, in that the left ear gave the same contradictory reaction, and it was impossible with cold water to get nystagmus in the healthy ear. Nothing abnormal has been discovered in the eyeground or in the urine.

Dr. Wilcox, the clinician of the hospital, reported that the man had a distinct arteriosclerosis. There is nothing characteristic about the vertigo. The man does not fall in any one direction. The attacks are for the most part not severe, and there is a vertiginous condition rather than a complaint of isolated attacks. The case is of interest from a diagnostic and therapeutic standpoint. Dr. Harris is inclined to believe that the condition is largely functional, being in all probability dependent on the original trauma.

DISCUSSION.

Dr. Haskin, who has seen the case from time to time, agreed that the disease was probably located in the semicircular canals.

Dr. McKernon, who had also seen the case, felt that from the history of the vertigo developing after the injury, there was probably a clot in the semicircular canal.

Dr. Duel called attention to the fact that the whole cochlea had to be destroyed in order to produce a loss of bone conduction. In some instances, where only a portion of the cochlea had been destroyed, Weber was referred to that side, and Rinne was negative on that side.

Injury Over the Mastoid, Followed by Immediate Loss of Hearing.

Dr. Kenefick referred to a case of injury of the head in a longshoreman whom he has seen. The injury was received over the mastoid, and was followed by immediate loss of hearing. There was no involvement of the middle ear.

NEW YORK OTOLOGICAL SOCIETY.

Dr. John L. Adams, President.

Meeting January 26, 1909.

Dr. James F. McKernon presented a specimen showing a

Sequestrum of the Entire Labyrinth.

This was removed in the course of an operation on the ear of a child 3½ years of age. There was history of otorrhea since 3 years of age. When seen by him there was a complete facial paralysis. Three days later the child became unconscious; temperature 104°. There was a spontaneous nystagmus toward the healthy side. He operated the same day. The mastoid was found extensively diseased. A Schwartze-Stacke operation was performed, in the course of which a sequestrum, representing the entire labyrinth, was removed. The dura was extensively exposed. Following the operation the temperature fluctuated and the child remained unconscious. Six days later the sinus was opened, and the blood current found normal. Four days later a lumbar puncture was made, showing a turbid fluid containing many bacteria. This was followed by a subarachnoid drainage with chromosized gut. Two days later another puncture was made, and a large amount of fluid withdrawn. A similar drainage was introduced at another point. For the first time now there was a return of consciousness. The posterior wound was closed on the twenty-ninth day, and the child made a good recovery.

McKernon dwelt upon the importance of puncture and drainage in cases of meningitis, and stated that in his belief many cases which we have lost in the past might have been saved if such a course had been pursued.

DISCUSSION.

Dr. Whiting referred to a case in a child of seven suffering from facial paralysis, where he had removed in the course of an operation a sequestrum of the entire labyrinth. The sequestrum was so large that he hesitated at first to remove it en masse, and attempted to take it out piecemeal.

DR. BRYANT reported the autopsy of a man who died recently in one of the hospitals for the insane in this city. The autopsy showed

Streptococcic Infection; Left-Sided Chronic Otorrhea; Thrombosis Extended from the Right Ear Almost to the Left Jugular Bulb; Thrombosis of Longitudinal Sinus, Forward to the Motor Area; and Thrombosis of the Cerebral Veins Between the Thrombosed Sinuses. Cause of Death Was Metastatic Thrombosis in Lungs.

History.—The patient had been seized with a maniacal attack about three weeks previous to his death, and had been admitted as insane. The psychic diagnosis was toxic, depressant insanity. The patient remained inaccessible. No motor symptoms were noted during life. No note of the ear condition was made until 12 days before death, when it was noted that one ear was discharging. No cause for the mental condition was determined previous to the autopsy. There is a rumor that cases come to autopsy from time to time where death is consequent to central complications of ear infection, but where no antemortem suspicion exists that the mental state depends upon an ear lesion.

Sinus Thrombosis Three-fourths of an Inch From the Seat of Inflammation.

DR. LEWIS reported an operation for mastoiditis where, owing to erosion of the inner table of the mastoid process, it was necessary to expose the sinus from a little beyond the knee to within a few mm. of the bulb. The sinus was healthy. During the two weeks following, the process of healing was in every way satisfactory, save a small spot over the knee of the sinus. The patient left the Infirmary, returning to the Clinic for dressing. One evening after a hard defecation he found the bandage soaked with blood. When later the dressing was removed a very severe hemorrhage followed. He was again put to bed; forty-eight hours later a chill occurred, followed by a rise of temperature. An operation for sinus thrombosis was performed the next day, and a clot was found, not at the point of ulceration of the vein, but some distance below in the jugular bulb. The internal jugular vein was tied and excised. The patient is making a good recovery.

The interesting points are: First—The minute area of

sinus apparently involved in the area of ulceration, not more than one mm. in circumference. Second—The fact that the seat of thrombosis was at least three-fourths of an inch beyond the inflammatory area. Third—The hemorrhage occurring spontaneously, a condition which, as far as I am aware of, has not been hitherto mentioned, and of course (fortunately) must be rare, as usually the thrombus forms in the vein around the inflammatory area, and thus prevents any such accident.

DR. WHITING reported two cases in children of a

Swelling in the Zygomatic Fossa.

Incision revealed that it contained a large quantity of pus. The mastoid antrum was healthy. There was a subdural abscess. The pus had escaped from the tympanum, through the Rivinian fissure. The inner table showed an erosion the size of a twenty-five cent piece. The second case was similar, save that it had burrowed in the region of the suprameatal triangle.

DR. QUINLAN reported a

Fatal Case of Mastoiditis.

in a man 39 years of age. An operation had been performed on the mastoid for acute typical condition, and apparently convalescence was assured. The wound healed and the man was discharged from the hospital five weeks after the operation. The patient returned two weeks later with well-marked redness along the line of incision, and with intense tenderness on the entire process. This was accompanied with a chilly sensation and a temperature of 103°. Ordinary conservative remedies were applied, but the case indicated surgical interference. A second operation was done Christmas Day. The wound was found to be filled with granulations, no pus, but upon close inspection it was noticed that the roof of the tympanum was absent. It had apparently been eroded away, and the dura sagged through the opening. An incision was made into the dura, bringing away only some serum mixed with blood. An inch of gauze was inserted to establish drainage, but the patient, some days later, developed convulsions and remained in a semicomatose condition for five days, when death followed.

DISCUSSION.

DR. DENCH said that he had seen several similar cases. The first was that of a woman suffering from an acute otitis media. Some mastoid tenderness was present when she first presented for treatment, but this disappeared after free incision of the drum membrane. Some weeks later the patient returned to the hospital, suffering from symptoms of mastoid involvement. The mastoid operation was performed, and extensive destruction of the mastoid process found. Convalescence was rapid, and the patient was discharged from the hospital. Four or five weeks after her discharge from the hospital, she again came under observation. The mastoid wound had almost entirely healed, and seemed to be in a thoroughly healthy condition. The patient, however, complained of headache, pain in the back and lower extremities, as well as general malaise. The temperature was 103 degrees. The patient was admitted to the hospital. A differential blood count showed no deviation from the normal standard. The temperature fell to normal on the day after admission to the hospital, and for several days the patient seemed perfectly well. Three or four days after admission, the patient suddenly complained of headache, the temperature rose to 104 degrees, and she rapidly developed symptoms of meningitis. The lateral ventricle on the affected side was drained, but the patient died.

In a second case a fatal meningitis followed an apparently successful mastoid operation. Here Dench drained the fourth ventricle. In his opinion, we have yet much to learn about these meningeal complications. Lumbar puncture is of decided value here, and can be profitably resorted to before any operation on the meninges is performed.

DR. LUTZ reported a fatal case of mastoiditis, occurring in a man who had a history of an otorrhea for six weeks. When first seen by him the man was complaining of severe pain on the side of the affected ear. There was a small quantity of pus in the ear, which seemed to come from an erosion in the posterior wall of the canal. There was no elevation of temperature or pulse. The operation was at first refused. Several days later, when he was called in to operate he found a sinus leading down into the antrum. There was pus in the zygomatic cells. The pus was found to proceed through the

dura, beneath which a large abscess cavity was discovered. This was thoroughly drained. The pus was not offensive. Eight days after the operation the temperature began to rise. On the tenth day the patient became unconscious; paralysis of arm and leg of opposite side, and death. No autopsy. The interesting point in the case was the extra large size of the abscess cavity, which occupied almost all of the left half of the cerebrum.

DR. DENCH reported a

Radical Operation for Double Suppurative Otitis Media.

No labyrinthine symptoms were present before operation. At the time of operation the oval window was found open and covered with granulations. No trace of the stapes was discovered. The granulations were carefully removed, but the labyrinth was not drained. The temperature rose to 101° after the operation, and for a few days there was slight nystagmus and staggering gait. Both of these symptoms rapidly disappeared, and the patient made a good recovery.

The reporter wished to know whether, in the opinion of the society, in the absence of labyrinthine symptoms, and the mere fact that the oval window was found open at the time of the operation, these conditions would be a sufficient indication for the institution of free labyrinthine drainage.

DISCUSSION.

DR. MCKERNON saw no reason for labyrinthine drainage in this case.

DR. WHITING was of the same opinion as Dr. McKernon. He referred to an operation which he had performed for encapsulated cholesteatoma, where a bud of granulation was found in the oval window. A probe showed it firm, so he let it alone. The patient recovered.

DR. DUEL reported a case which he had recently seen where the

Smear Taken From the Secretion Following an Incision Made in the Drum Membrane Showed the Colon Bacillus.

This was a case of a patient suffering from a slight stuffiness in both ears, associated with sore throat. There was no elevation of temperature and no pain. Examination showed a red-

ness and loss of lustre of the right drum membrane; congestion in Schrapnell's and along the malleus, without loss of lustre in the left. A solution of adrenalin chlorid was ordered locally. Next day the redness had disappeared from the left drum membrane, but had increased in the right. The day following, this membrane was incised under gas anesthesia, as it was distinctly bulging, dark red in color, and without lustre. There was no pain or rise in temperature. A gush of red fluid followed. The smear showed the colon bacillus. The drum membrane healed and the patient recovered, without complication, in ten days.

NEW YORK OTOLOGICAL SOCIETY.

JOHN L. ADAMS, M. D., PRESIDENT.

Regular Meeting March 23, 1909.

DR. ALDERTON presented the brain of a patient who had died from temporosphenoidal abscess, with the following history:

Case of Brain Abscess of Otitic Origin.

Albert H. Age 44 years; laborer; German. Admitted to the King County Hospital, December 5, 1908. Family and previous history could not be obtained because of the patient's inability to talk; but patient points to the throat and claims to have had trouble for four months.

Patient is a fairly well-nourished male, weighing about 140 pounds. He has ptosis of the left eye, left facial paralysis; the tongue is dry and coated and deviates to the left. There is a large amount of muco-pus in the pharynx, which he is unable to expel; also, paralysis of soft palate, and patient is unable to swallow even small quantities of fluid. There exists a purulent discharge from the right ear; no tenderness, edema or redness over either mastoid; no cording along neck. Heart and lungs are normal.

December 6, 1908. Patient has developed considerable post-cervical rigidity; left pupil contracted and sluggish; considerable photophobia; paresis of left arm and leg, but no absolute hemiplegia; left knee jerk increased; slight left ankle clonus; all left arm jerks increased; is in a semicomatose condition and has large quantities of mucus in pharynx.

December 7, 1908. Patient is brighter this morning; left-sided paresis decreased.

December 8, 1908. Patient sinking into coma at 1 a. m.; lungs filling up; pulse rapid and weak; respiration rapid and labored. 4:30 a. m. patient died.

On December 6th Dr. Tilney was called in consultation and diagnosed an inoperable brain abscess; his report is appended.

The neurological examination made of the patient on December 6th brought out the following facts:

The Reflexes.—All the reflexes on the left side of the body were exaggerated both in force and degree of excursion as compared with those of the right side. Babinski reflex positive on the left side. A slight transitory clonus was observed in the left foot. Negative on the right side.

Voluntary Movements.—Voluntary movements in the left arm and leg apparently abolished. Nurse reports that during this entire day the left extremities have not been observed to move, although the patient is able to respond to all commands which have reference to the right arm and leg.

Sthenic and Tonic Muscular Conditions.—A marked rigidity of the sternocleidotrapezius group on the left side was observed. All the flexor and adductor groups of the left arm and leg, so that the limbs were held in partial flexion and adduction. That this rigidity was of the lower neuron type was evidenced by the fact that the muscular tonicity was not in any degree influenced by the will, although it was apparent that the patient could be made to understand all requests with reference to movements of the limbs.

No change was noted in the volume or consistency of the muscles, nor were any tremors, twitchings or irregular involuntary acts reported or observed. Such coordination as the patient presented in the right extremities was good, but, due to the paresis on the left side, this could not be accurately adjudged.

The patient could neither walk, stand nor maintain the sitting posture.

The semicomatose condition of the patient prevents any exact statements as to the sense qualities, subjectively as well as objectively. Sense perception appared to be normal to such tests as were applicable. A very definite area of sensitiveness was mapped out in the right neck region and about the right mandibular and mastoid processes.

Cranial Nerve Innervations.—Observations as to special senses could not be depended upon. Muscles of both eyeballs were apparently normal in their innervation. A slight left ptosis and paresis of the left orbicularis palpebrarum was noted. The ocular reflexes were all normal.

The entire left side of the face was paralyzed. Mastication was normal, but the act of deglutition was accompanied by considerable regurgitation per nares. Left-sided paresis of

the muscles supplied by the spinal division of the spinal accessory nerve, and also a left hypoglossal paresis.

Mental Status.—Patient was stuporous, but could be aroused to respond to some requests and answer questions.

The diagnosis of a right-sided brain abscess was based on the following:

1. The febrile action, which, in conjunction with the characteristic leucocytosis, indicated a purulent process.
2. Evidence of a purulent otitis media of the right side.
3. Presence of a left hypertonic hemiparesis.

Autopsy.—December 9th, 1908. Dura, after removal of the calvarium, slightly adherent. The sigmoid sinus contained blood, coagulated and in the fluid state. The pia mater shows marked congestion of the veins. The subarachnoidal space of the convexity of the brain contains no pus. After removal of the brain, purulent fluid containing shreds and parts of destroyed brain tissue flows off into the middle cerebral fossa and collects upon the tentorium cerebelli. Dura and pia are adherent in different places at the base of the temporal lobe, and in taking the brain out its substance is here torn in a spot exactly corresponding to a place where an abscess within the temporal lobe was most superficial. This spot corresponds exactly to a perforation of the dura just above the tegmen tympani and antri of the right temporal bone, through which a probe passes easily into the antrum of the right ear. The dura of the median cerebral fossa, above the tegmen tympani and above the glenoidal fossa, is bulging considerably towards the cranial cavity; this bulging is caused by a substance of dough-like consistency presenting the appearance of cholesteatomatous masses mixed with creamy pus.

The microscopical examination of these masses shows detritus, pus cells, epithelial cells, cholesterin crystals and numerous diplococci (micrococcus lanceolatus).

The spot where the probe penetrates through the dura and tegmen tympani into the antrum corresponds exactly to a perforation of the temporal lobe, leading into a stalked multilocular abscess of the temporal lobe, about the size of a walnut.

DISCUSSION.

In reply to a question from Dr. Rae, Dr. Alderton stated that he did not operate because the neurologist who had seen the case thought the condition did not permit any operation,

but he was inclined to believe that another time he would have operated in spite of the neurologist's opinion.

DR. ALDERTON presented a case of

Entotic Tinnitus

with the following history:

Case of aural tinnitus; subjectively and objectively perceptible:

A young lady, 31 years of age, was referred to Dr. A——, January 12th, 1909, by Dr. Pendleton of Brooklyn.

She complained of noise in both ears, which had persisted for from five to six weeks; with this there was some blurring of the hearing; also, at times, sharp, shooting pains from throat to the ear. History of discharge from the right ear eight years previously, following the grip.

Examination.—A. D.: Canal normal; membrana tympani irregular in texture, slightly retracted, but of good lustre. Watch heard 2 feet. Lower tone limit c^2; C ac>Bc; C^2ac>Bc. Upper tone limit normal.

A. S.: Canal normal; membrana tympani same as A. D. Watch heard 1½ feet.

L. t. l., c^2; C ac>Bc; C^2ac>Bc. Upper tone limit normal.

Both Eustachian tubes patent. Nose shows moderate deviation of septum to the right.

On using the otoscope a bruit is heard in both ears, which is synchronous with the pulse; which varies in intensity when present and which disappears entirely from time to time. Pressure on the carotids sometimes will not influence the tinnitus. Changing the position of the head will sometimes cause the tinnitus to disappear when present, but does not seem to cause it to appear when absent. During inflation with the Eustachian catheter the tinnitus will sometimes disappear when present. There is no goitre.

DISCUSSION.

DR. BERENS spoke of the variation in the rate and duration of the pulse during his examination.

DR. DENCH spoke of the possible involvement of the cervical sympathetic.

DR. GRUENING suggested the possibility of pressure in the region of the cavernous sinus.

DR. COWEN referred to a case presented by him to the so-

ciety many years ago where pressure on the carotid stopped the noise, but the patient could not endure continuous pressure in that region.

Dr. Alderton was inclined to think that the condition was a muscular one and was partially under the patient's control.

Dr. May reported a case of

Atypical Erysipelas Simulating Disease of the Lateral Sinus.

The patient was a child of ten who, two weeks previous to being admitted to the hospital, suffered pain in the left ear, necessitating the opening of the drum. A good recovery followed. On admission to the hospital there was a temperature of 105 with chill. Pain was elicited on pressure over mastoid. There was edema in this region. The left drum was red and a little swollen. The mastoid was opened and found healthy. The sinus was then opened and also found healthy. The blood culture was negative. The temperature fell after the operation. Twenty-four hours later there was another chill with high temperature. The right mastoid became tender. The right drum was red. The mastoid operation was performed on the right side; no disease was found. The right sinus was also exposed and found normal. The following day erysipelas developed, the redness starting at the nose.

DISCUSSION.

Dr. Bacon inquired if there was edema of the scalp.

Dr. May stated that the edema did not extend beyond the mastoid. The gland below the tip was enlarged, suggesting involvement of the lymphatics.

Dr. Gruening did not think that the symptoms as given by Dr. May pointed to mastoiditis.

Dr. Berens stated that he had reported a case of extensive destruction of the mastoid where the drum was normal.

Dr. Lewis referred to a case of mastoiditis under his care some time ago where the only symptom was headache—there was no otorrhea. The operation showed a cortical perforation with epidural and perisinous abscess.

Dr. Toeplitz spoke of the difficulty of diagnosis in children between erysipelas and mastoiditis.

Dr. Cowen thought that the closer we keep to the association between the middle ear and mastoiditis the less chance of error. Primary mastoid disease was very unusual.

DR. MAY stated that he operated only because of the serious condition of the child and in spite of the absence of distinct localizing symptoms.

DR. GRUENING thought that the initial stage of erysipelas may simulate sinus thrombosis.

Severity of Mastoiditis.

DR. QUINLAN inquired if cases of mastoiditis this winter in the practice of members of the society had been severe ones. Those under his care had been very severe. He spoke of the case of a girl whom he had operated upon in St. Vincent's Hospital. Blood examination showed leucocytes of 14,000 and a differential count of 73 to 74 per cent. The operation showed involvement of the deep tip cells.

DISCUSSION.

DR. BACON stated that as far as his experience was concerned he had seen about the usual run of cases this winter.

Bacillus Pyocyaneus in the Middle Ear.

DR. BACON reported two cases with unusual pathologic findings. One was the case of an adult; the other a case of a child, in both of which a smear made after the opening of the drum showed the bacillus pyocyaneus.

DISCUSSION.

DR. DENCH inquired if a second smear had been made. He had seen a case where the first smear gave the bacillus pyocyaneus, but the second smear showed an error in diagnosis.

DR. ALDERTON reported a case of

Mastoiditis Without Localizing Symptoms, but With Profuse, Long Continued Discharge From Ear.

The case was a male who had been treated by a local physician for discharge from the ear, from May until the following November. Repeated incisions had been made into the drum, which showed no material improvement in discharge. When first seen by Dr. Alderton there was a pin-point perforation, with slight bulging and thick pus. Dr. Alderton advised a cross-cut incision, and, if no improvement, a mastoid operation. The general health continued good, but the discharge did not let

up, and at the next visit by the patient an operation was advised and was accepted. The operation showed the tip full of pus. An uneventful recovery followed.

DR. ALDERTON reported a second case of a girl, where the operation showed the

Outer Table Involuted So That the Mastosquamosal Suture Was Present.

Only the antrum was diseased. There was a well-defined line of healthy bone between the diseased areas.

DR. DENCH reported a case of a girl, who suffered from a

Swelling in Front of the Zygoma.

The drum membrane was of normal luster and showed only slight bulging and slight sinking of the canal wall. Membrane incised, found normal. Two days later swelling was opened. The usual mastoid operation then was performed, showing well-established evidences of disease.

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